NEWS IN PERSPECTIVE

MANAGEMENT VIEW

"OPERATION BIRD DOG," recently launched Kansas Gas & Elect. Co. industrial development "prospecting" program, is another potent effort to put a big team in the field with the aim of reaching a utility's big marketing targets. KG&E's campaign calls on not only the utility family, but all local people (or, all Southeast Kansans) to solicit their friends, suppliers and business contacts for confidential leads regarding contemplated plant expansions.

ROLE IN POLITICAL ACTIVITY of Detroit Edison and four other U.S. corporations (Ford, Chase-Manhattan Bank, Brown-Forman Distillers and Mead-Johnson) will be interpreted for an AMA briefing session in NYC this month. Detroit Ed's approach is to be spelled out by VP Sylvester Leahy.

ADIEU, WITH CASH--At least with more of it than laid-off employes get from financial, retail or wholesale businesses -that's the severance story for employes separated after long service with electric and gas utilities, according to an ICB survey. Most utilities give over -month's pay to employes with 5 years' service, and for 25-year employes, one week's pay or more per year of service.

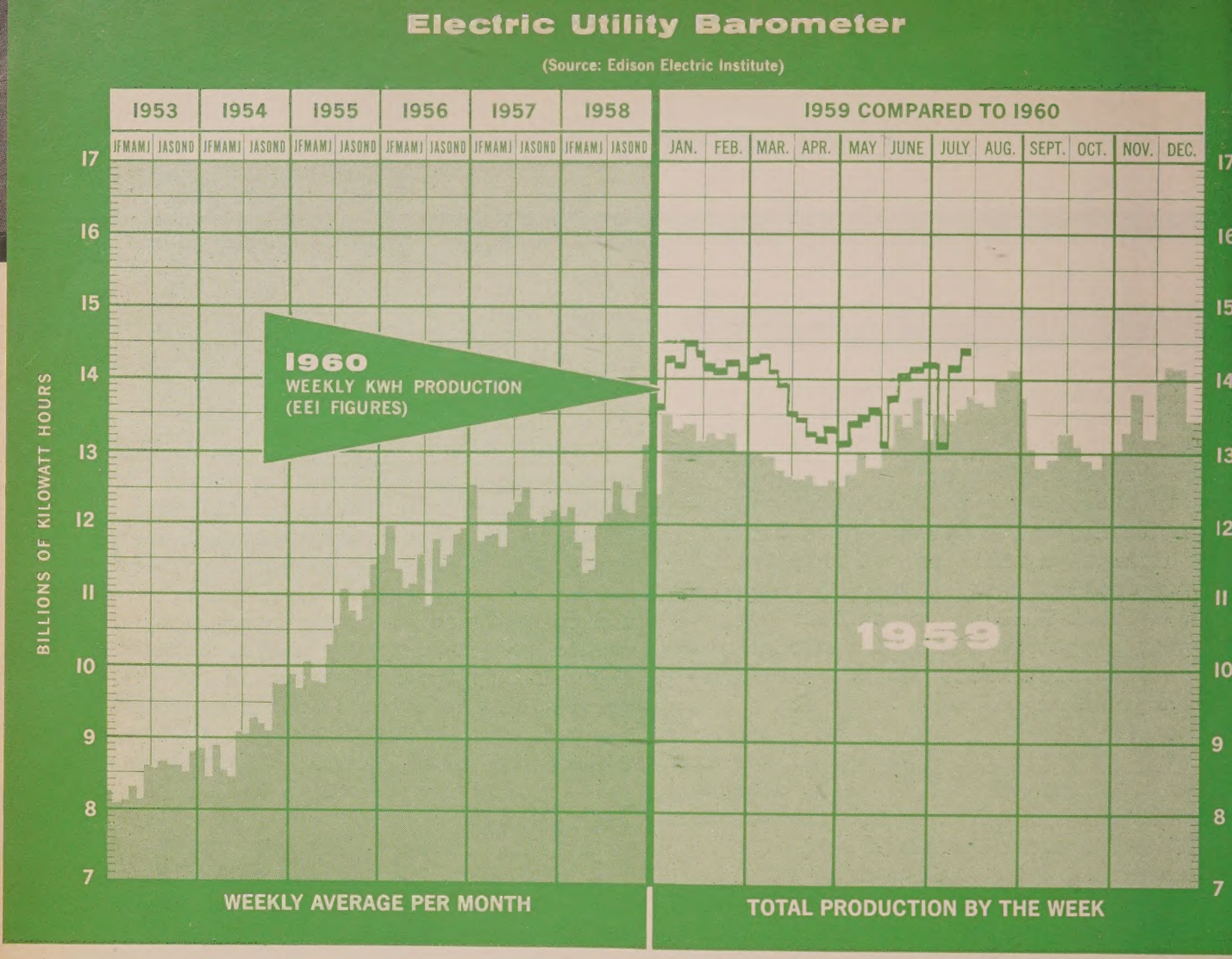
"WE DO NOT KNOW WHAT BASE the Commission is using to calculate an 8-percent return," said Florida P&L's V-P Harry Simpson in reacting to the Commission's surprise" charge that the utility's rates are too high, compared with the ceiling of 6.98-percent placed on Florida P&L's earnings three years ago. The utility's earnings jumped more than $3- million in the 12 months ending March 31, but V-P Simpson maintains: "Based on methods used in the past of calculating our rate of return, we do not believe our return is excessive . . . and we believe we can convince the Commission." FP&L will get the chance Sept. 13, when its rate scale is to be submitted, at the Commission's request.

"COAL'S TRUE PICTURE in our dynamic economy and the contribution that it will have to make, and I believe will make, in satisfying our rapidly growing energy requirements both for defense and for peace--this is what we in Kentucky Power and in American Electric Power have worked very hard to try and develop," AEP's Philip Sporn observed in his remarks at the ceremony marking ground breaking for Kentucky Power Co.'s 265,-000-kw Big Sandy Plant. "In the last half-dozen years there has been a tendency to write coal off as an obsolete raw material, something that was useful in the Dark Ages, but that is not going to have any application in the atomic era we are coming into."

ECONOMIC CLIMATE

SIGNIFICANT PRODUCTIVITY GAINS were made last year in a number of major U.S. industries. Rebounding from the 1957-58 dip, output per man-hour of production workers rose sharply in industries of significance to electric utility operations. For the whole private sector of the economy, there was a productivity increase of four percent. This was considerably exceeded in anthracite mining (10.2 percent), bituminous coal and lignite mining (8.7 percent), and basic steel (12 percent).

ATTITUDE OF WATCHFUL WAITING is seen by the National Association of Purchasing Agents as a prime contributor to a larger-than-seasonal summer slowdown in the economy. Other influences include uncertainties generated by forthcoming national elections, the rate of defense spending, the impact of lackluster steel production, and concern about the recep-



NEWS IN PERSPECTIVE

tion to be accorded to 1961-model cars in the face of this year's vast marketing changes. Purchasing agents say that this is "certainly not a depressing situation," but add that "it is obvious that for many it could look a lot better."

IMPROVED EMPLOYMENT OUTLOOK calls for modest but widespread gains in both manufacturing and non-manufacturing industries. This is in line with seasonal expectations. Bigger gains are expected in non-manufacturing industries. Rate of unemployment will not decline appreciably, if at all, because of growth of the labor force and termination of a sizable number of seasonal jobs.

WASHINGTON INFLUENCE

POLITICAL PARTY PLATFORMS refer to natural resources development in terms of adequacy and tempo quite like the way the GOP and the Dems view the condition of the nation's military preparedness posture. Where the Republican promise is to "continue the development of power capacity, flood control, irrigation, new water resources and other projects with the same speed achieved during the last seven years, the Dems call this only slow progress, promising to speed things up.

SIX NEW STARTS in a $294-million construction program are planned by the Bureau of Reclamation for the current fiscal year. Although Congressional action may call for some adjustments, Commissioner Dominy called the budget realistic. Comparable program for last fiscal year was $206-million. If approved, 48,000-kv of hydro capacity will be installed and 1,835,300-kw added to the national capacity from projects or units under way. Proposed new starts are La Feria Division of Lower Rio Grande;

NEWS IN PERSPECTIVE

Bully Creek of Vale, Oregon; Almena and Yellowtail Units of Missouri River Basin; and Curecanti unit and Florida Participating Project of Colorado River Storage. Work will resume on Missouri River's Ainsworth Unit and construction continue on 39 projects or units of projects to be undertaken by Reclamation in 17 western states.

FEDERAL LEADERSHIP is "vital" if water requirements are to be met in the next 40 years, Dr. Ackerman of the Carnegie Institution has told the Senate Select Committee on Water Resources. He suggested coordinating Federal operations with those of other public and private agencies. But it must be done "in a manner which will assure that benefits from . . . basinwide development or large-scale organization of distribution facilities will be available in all parts of the country." Specific recommendations are: (1) "Establish comprehensive development . . . as the procedural pattern for future action in water resource development"; (2) "Make the creation or completion of integrated basinwide regulation systems a primary objective of Federal activity on all streams where physical conditions and the legally determined federal interest make such regulation appropriate"; (3) "Simplify the federal program concerned with direct water use (Permit non-federal groups to build small irrigation, flood prevention, power recreation projects); (4) "Develop strategy for the growth and application of technical improvement (including scientific research aimed at increasing and conserving water supplies)."

RECREATION BENEFITS as well as economic benefits of fish and wildlife are stressed by the Senate Select Committee on Water Resources. It advocates conservation be included as a specific project purpose rather than as a by-product of project development. The group headed by Sen. Kerr (D., Okla.) advised against artificially and arbitrarily limiting project costs allocated to the resource and urged recognition of the fact that fish and wildlife benefits go beyond monetary considerations." The report suggests increasing research on fish problems and sets forth a long list of problems arising from water development and recommended solutions.

TVA COAL RECEIPTS during fiscal 1960 totaled nearly 18.9-million tons. Stockpile at the end of the fiscal year was 5.1-million tons. TVA expects to consume almost 20-million tons in the current fiscal year.

REA BOND SALES during their first month of issue totaled more than $1.1-million. The 2-percent bonds, designed by Treasury to hold cash funds for co-ops, are redeemable on short notice. Purchases ranged from a low of $10,000 to a high of $115,000, with four borrowers buying $100,000 bonds.

INDUSTRY SIFTINGS

CLOSE TO 500-KW OPERATION, achieved with the world's largest generating unit at Indiana & Michigan Elect. Co.'s single-unit Breed Plant, indicates that a thermal efficiency mark of around 40-percent will be reached--making this also the most efficient power producer ever built, according to Philip Sporn, president of I&M's parent American Elect. Power. (See page 33.)

DISAPPROVE "BEST LOOKING"--Even as Connecticut L.&P. Co. put in service a 150,000-kw generating unit in what the utility proudly described as the nation's "best looking station" (at Norwalk Harbor --see page 32), a homeowners association brought suit against Conn. L.&P. to halt the intended doubling of the facility's capacity, saw a superior court judge dismiss the suit, then decided to appeal the PUC ruling to the state supreme.

FEDERAL SAFETY REGULATION?--Rep. Thomas L. Ashley urges such Federal intervention to set safety standards for the utility industry, which he charges, permits its employes to do their jobs under the "serious handicap" of "inadequate safety measures and outdated safety equipment." (See "Washington Outlook," page 36.) Best kind of refutation is the record: National Safety Council reports that frequency rate for electric utilities in '59 (6.06 injuries per million man-hours worked) was improved over '58 and better than the all-industry average

of 6.47. Electric utility industry's severity rate in '59 (1199) compared with the all-industry average of 754, but both figures showed poorer performance when compared with the 1958 records.

FIRST COOLING TOWER of its kind in the Western Hemisphere--of concrete construction and hyperbolic shape--will be used to condense steam in Kentucky Power Co.'s new 265,000-kw Big Sandy Plant, for which ground was broken last month. The tower will rise 320 feet above the ground, with a base diameter of 245 feet tapering to 140 feet at the top.

NATION'S BIGGEST UTILITY, Pacific Gas & Elect. Co., has an assessed valuation of $1,063,000,000, highest of a record total assessed privately-owned utilities in California--up 4-percent over the previous year.

ALL TRANSFORMER STANDARDS are now available in one book, NEMA's No. Tr 1-1960, after several years of effort by the Association's transformer section, "plus a generous amount of cooperation from other allied industry organizations." (Copies are available for $1 each.)

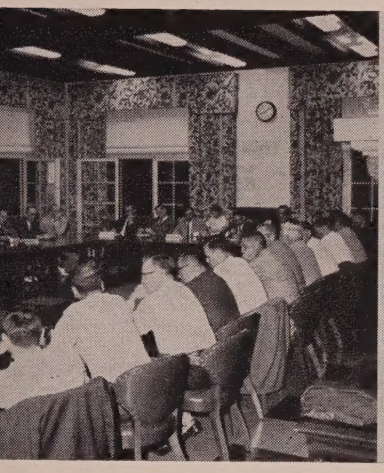
$10-MILLION ANNUAL SAVINGS could result from price reductions General Electric has announced on pole-type distribution transformers. The new price levels, as much as five-percent below previous levels, "reflects GE's recognition of market trends and increasing desire on the part of the electric utility industry toward fewer standard kva ratings." GE's distribution transformer marketing manager, W. R. Smart added: "The manufacturing cost savings which can be realized from utility support in volume purchases of fewer kva ratings enables us to reduce the price of those kva sizes which the majority of utilities reported they would standardize."

GROWTH RATE VARIATIONS--There are sharp variations in load growth rates between the various states, points out Michael J. Kraemer, executive consultant for Commonwealth Services, Inc. He reports: As compared with the nationwide increase in per capita sales in the five years 1954-59 there were 19 states which had greater rates of increase. While in 1959 three states recorded per capita sales of less than 2,000-kwh, "relatively low, these states made notable advances in building up per capita sales in the past five years," observes Mr. Kraemer.

RETAIL PROFIT MANAGEMENT PROGRAM, under study by Whirlpool for a year, is aimed at providing information on the best proven ways of administering and operating a retail appliance business. It is offered to Whirlpool distributors, "who must do a good job of managing their own businesses," in order for Whirlpool to be successful and profitable in the long run, the manufacturer observes.

THE COMMISSIONS DECIDE: In Wisconsin, the Commission denied a proposed rate increase to the Wisconsin-Michigan Power Co. Significantly, in arriving at the rate base, the Commission deducted, in addition to accrued Federal income taxes, an amount for accrued employe vacation pay and provision for future injuries and damages. In No. Dakota, the Commission held that the Montana-Dakota Utilities Co. had not met the burden of proving that proposed new rates were just and reasonable. Said the Commission: "The utility argues that its favorable financial position is due to the prosperity of its gas department, but it has presented no evidence to demonstrate this claim."

CO-OPS SERVING NON-RURAL customers in Illinois are being challenged by Illinois Power Co., which says, though it does not object to rural co-ops serving rural customers, it does object to them serving urban, suburban and industrial customers in territory for which Illinois Power has a certificate of convenience and necessity. Territory in dispute includes an area where the private utility had transmission lines prior to the organization of the co-ops. Illinois Power, saying the co-ops are public utilities but are not conforming with the Illinois Public Utilities Act, has petitioned the Illinois Commission to compel compliance.



"Making use of every minute of a full 13-day program" . . . combining the full discussions of "plenary sessions" . . .

with the formal presentations in "group sessions" of specific knowledge of industrial authorities and academic specialists . . .

and the further concentration on individual problems in even smaller and more intimate "work groups" . . .

Executive Development Programs Boom —And, One University Takes Stock

Interest in university executive development program is widespread . . . and growing. Because of this, a closer look at one of the older, better established programs may be useful in judging the effectiveness of the one you support, have attended, or may consider attending.

Such a program is Columbia University's "Utility Management Workshop"—designed, of course, especially for management training of utilitymen. (Columbia offers others for representatives of diverse industries—(see photo below.)

Columbia University's "Utility Management Workshop" was offered in its ninth version in the past month, and judicious application of the best ideas from some extensive opinion checking following the 1959 presentation made it by far the most effective ever.

With a number of built-in limitations on "growth" (enrollment ceiling of 36, cost-per-participant of $1,000), this middle-management training program has quite naturally aimed at quality improvement over the years, though there was a special effort to fit the Workshop to the Utility Industries needs in 1960.

Columbia's formula for the long-established series combines "the flexibility and informality" of the workshop approach, a "perfect setting for conferences" (stately, isolated Arden House), widely trained "experts," ample time as the "catalyst," exposure to an ever-growing list of "new concepts." To take advantage of it all, nominees are required to be "mature and experienced executives who have demon-

Columbia University's Executive Program in Business Administration, a six-week course offered twice a year since 1952, brings more executives concerned with electric power to the University's Arden House. Among the "senior" executives representing diverse industries in the 1960 summer session were (l to r): Robt. R. Fortune, comptroller for Pennsylvania P. & L. Co.; Justin T. Rogers, division manager of Ohio Edison; Austin Gavin, general counsel for PP&L Co.; and Herman R. Hill, jr., manager of manufacturing for GE's largest steam turbine-generator dept. At right is the program director, Hoke S. Simpson. Among other U. S. electric companies which have been represented at these programs in past years are: Alabama Power Co., Amer. Elect. Power Service Corp., the Cleveland Elect. Illuminating Co., Detroit Edison, Gulf Power Co., Iowa-Illinois Gas & Elect. Co., Penn. Power Co., The Southern Co. and Utah P. & L. Co.

strated their management ability" . . . and evidenced ability to participate in a study project and benefit from it.

The workshop sponsors, backed by an advisory committee which includes top-level executives of ten utility companies, have retained the active participation of a score of utility organizations from all across the country – particularly, among electric companies, Alabama Power Co., Central Hudson Gas & Electric Corp., Georgia Power Co., New Jersey Power & Light Co., N. Y. State Electric & Gas Corp., Niagara Mohawk Power Corp., Ohio Edison Co., Orange & Rockland Utilities, Inc., and United Illuminating Co. And, each year, while some companies decline to make new nominations for various reasons, a few more companies are represented for the first time (in 1959 Baltimore Gas & Electric, Boston Edison, Consumers Power, Jersey Central P. & L. and Tampa Elect.).

But, interestingly, in preparing for the 1960 sessions, the Workshop staff started with the view that there are many ways to run a workshop. (In a sense, practicing what they preach: "there are no automatic solutions to management problems; we make no attempt to teach a particular viewpoint.") While fresh from their experience in the '59 workshop, participants were asked to review the sessions and their own gains from them, and such things as (1) shortcomings, (2) major strength, (3) effectiveness and "worth to you," (4) how results are being applied.

The "class of '59" was frankly critical, asking for such things as: "a curb on aimless discussion," reduction of duplicating reading material, "less vague and pointless theory." There was considerable agreement on the lack of value in one discussion project—on mergers. Then, with case histories of management problems playing a big part in the workshop discussions, the experienced participants recommended that an effort be made to induce participants to sumbit "a better quality of cases for analysis."

Prof. Robert T. Livingstone, director of Columbia University's Utility Management Workshop, makes use of a variety of visual aids in the classroom.

And, above all, the "graduates" of '59 urged that the staff do a better job of informing participants in advance about the precise roles they are expected to play in the rather fully planned workshop activities.

There were frequent mentions of "good organization" of the program details, nevertheless, and the record of results applied back on the job would argue strongly for the value of the Columbia Programs. Almost to a man, the greatest single benefit noted in replies to the University's post-Workshop questionnaire was in terms of *better communications.* In one way or another, participants come away with a greater appreciation of the need for improving the transmission of ideas and actions in their own organizations.

They also list high among the "innovations to be undertaken as a result of some aspect of the conference": (1) greater participation in decision-making, (2) more attention to the man-job relationship, (3) re-emphasis of responsibility delegation and planning with subordinates.

Endeavoring to reflect these views in their program planning, the Columbia University Workshop staff appeared to succeed in achieving their own quality gain over the previous year . . . and perhaps took a bigger jump forward in overall workshop effectiveness than was ever made before.

More California Hydro

New South Fork Project Output: 430-Million kwh

New waterpower sources in California? There's 430-million kwh a year in one . . . and field work is now progressing on this major water and power development—the Oroville-Wyandotte Irrigation District's project on the South Fork of the Feather River in the northern part of the state.

After the District was assured of more than $65,000,000 to finance the project by the sale of revenue bonds the construction contract was awarded to a joint venture of construction firms known as Oroville Project Contractors and including Atkinson-Ostrander Company, L. E. Dixon Company, The Arundel Corporation and Hunkin-Conkey Construction Company. The construction bid was $52,636,785 and the balance of the costs will be for land acquisition, administrative and legal expenses, engineering, construction management and contingencies.

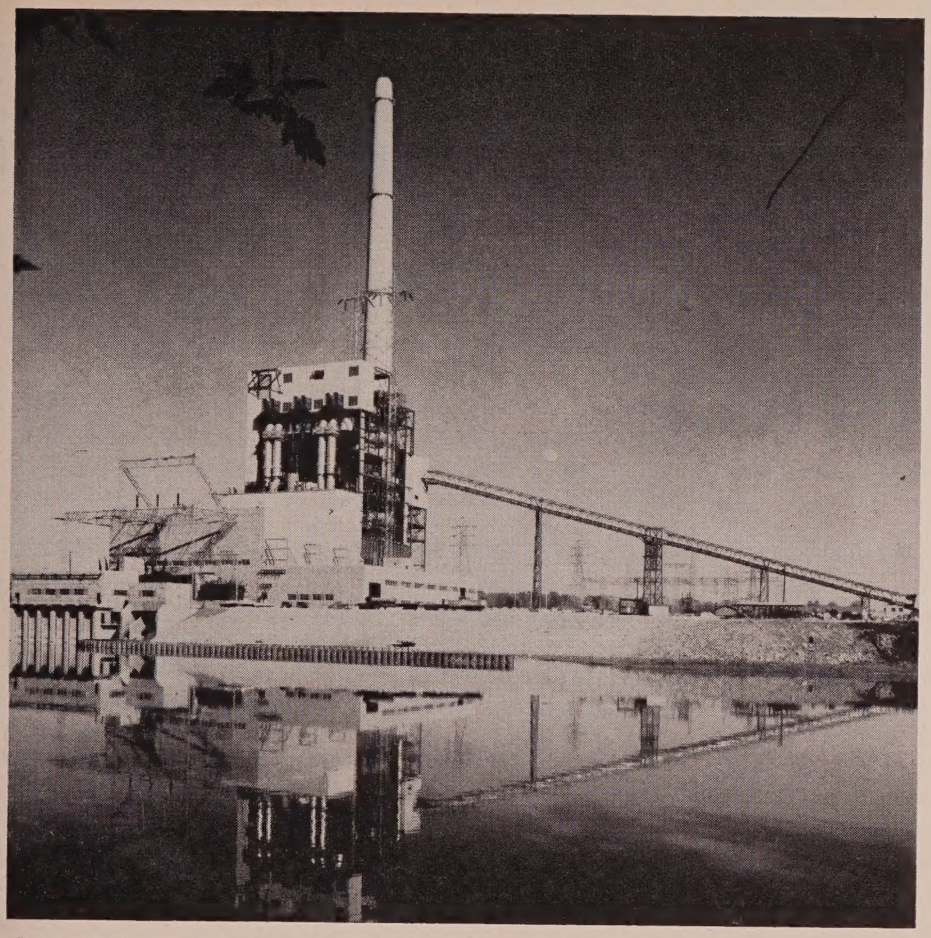
Bechtel Corporation has been active in the project since April, 1958, when it was retained by the District to perform engineering services and to manage and supervise construction.

The South Fork Project, as the development is best known, will use the waters of the South Fork of the Feather River and of adjacent Slate Creek for additional domestic and irrigation supply as well as for power generation. The District's service area covers 24,000 acres in Butte County. The new facilities will make available to the District more than 58,000 acre-feet of water annually on an irrigation basis during the first 20 years of operation and approximately 70,000 acre-feet annually thereafter. An additional supply of 8200 acre-feet per year will be diverted to the neighboring Yuba County Water District.

Included in the South Fork Project are four dams that will create reservoirs with a total storage capacity of 170,000 acre-feet, three smaller diversion dams, about 17-miles of tunnels and 21-miles of power and irrigation canals. There will be three hydroelectric generating stations which will have a total rated capacity of 90,000-kilowatts and will generate 434-million kilowatt-hours in a year of average runoff.

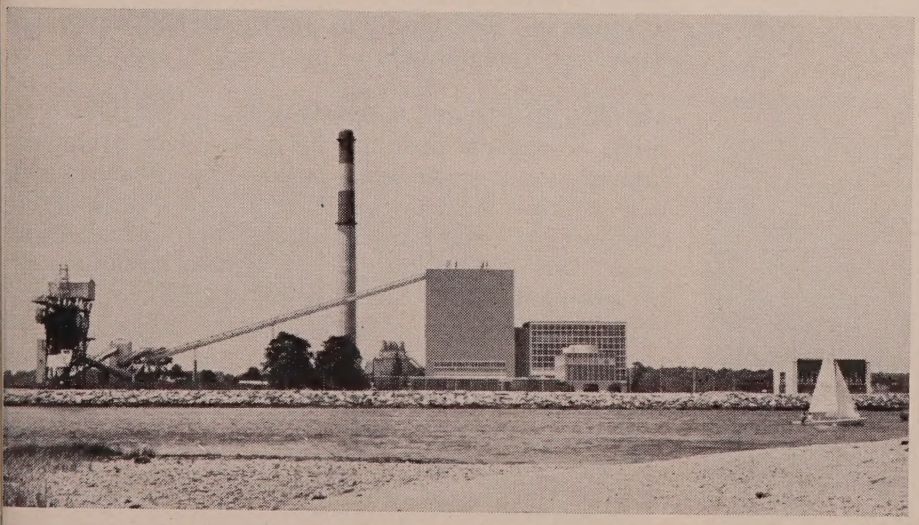
In a cooperative arrangement with the District, Pacific Gas and Electric Company has entered into a 50-year contract to purchase the entire output of electricity. This will bring the District an annual revenue of more than $3,000,000.

World's Largest Generating Unit—



The world's largest electric power generating unit—the 475,000-kilowatt Unit 1 has gone into commercial operation at the Breed Plant, owned and operated by Indiana & Michigan Electric Co. of the American Electric Power System. It is located in Sullivan County, Ind., on the banks of the Wabash. Total cost of the plant, where only finishing touches remained to be performed as the plant went into operation, is estimated at $71.5-million. This is exclusive of the various transmission, switchyard, substation and line facilities required to interconnect and integrate the Breed plant with the balance of the I. & M. System and with all of the AEP System.

America's "Best Looking Generating" Station—



"Best Looking Generating Station in America?" Connecticut L&P Co's newly dedicated Norwalk Harbor Station was so described in brief ceremonies at the island site, formerly used as a summer estate and religious retreat center. The station is covered with light blue aluminum siding to blend with waters of Norwalk Harbor; and the area is attractively landscaped with extensive plantings of trees and shrubberies. Attractive as the utility has made it, though, a property owners' association objects to a second unit in the new station.

Indiana & Michigan Unit Operates Close To 500-mw

Generating capacity of Indiana & Michigan Electric's single-unit Breed Plant in Sullivan County, Ind. has been revised upward to the new rating of 475 mw from the original level of 450 mw.

Philip Sporn, president of I&M and of its parent, American Electric Power explained that the unit had undergone extensive tests and had been successfully operated at close to 500 mw. It is now in commercial operation. He emphasized that the plant's single unit not only is the largest in the world from the capacity standpoint, but also is expected to be the most efficient power producer ever built.

Design calculations and expectations are that the unit's heat rate and thermal efficiency would be 8535 Btu per kwh and 40 percent, respectively. However, final determination of this efficiency must await actual operation over a period of at least several months.

Major contributing factors to the anticipated efficiency, aside from the unit's size are its steam pressure of 3500 psi, an initial steam temperature of 1050F, and double steam reheat temperatures also of 1050F.

The new unit raises I&M's total generating capability to more than 1450 mw, an increase of about one-third. It will also boost the entire AEP System's capacity above the six-million-kw level, making it the first private utility system in the world to achieve that milestone in generating capability.

Provision was made in the plant design for the eventual construction of a second 475,000-kw unit. Likewise, provision was made in the coal contract (with Aryshire Collieries, Corp., of Indianapolis, for 15 years) for a doubling of the fuel supply at that time.

While the 475,000-kw unit is capable of producing 110-percent more electric power than the AEP System's previously largest units (225,000-kw), it occupies a cubic space only 75-percent larger, helping to bring about a reduction in the capital cost per kilowatt of capacity, AEP officials point out.

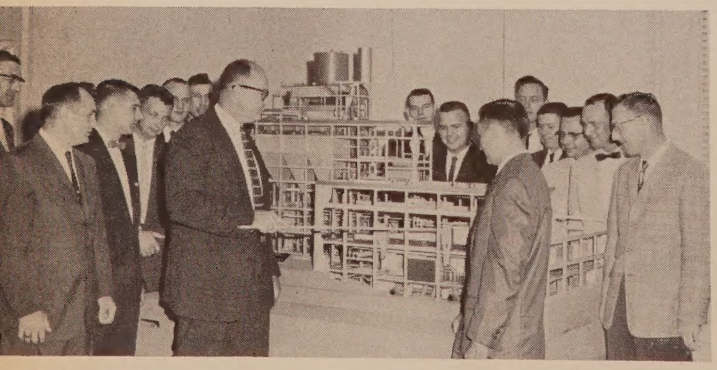
General Electric Co. built the turbine generator and Babcock & Wilcox Co. built the boiler.

THE NEW McKINNEY REPORT, which calls the Atoms-for: Peace program a failure (see EL&P, Aug 1, p. 8) because the U. S. reactor development program has concentrated on near-term hardware rather than long-term research, includes a specific recommendation to the JCAE concerning how industrial participation should be encouraged: AEC administrative procedures should be simplified . . . and patent safeguards should be made more effective.

PARTY PLATFORM PLATITUDES abound in the Democrats' references to atomic energy. Example: "In order to restore U. S. leadership in atomic development, the new Democratic Administration will—1. Restore truly non-partisan and vigorous administrations of the vital atomic energy program; 2. Continue the development of the various promising experimental and prototype atomic power plants which show promise (sic), and provide increasing support for longer range projects at the frontiers of atomic energy applications." One specific aim of at least potential significance: "the separation of quasi-judicial functions in reactor safety regulations."

BETTER ZIRCONIUM ALLOYS—less expensive and of higher quality—must be developed by fabricators if they want in on the future nuclear reactor business. A dozen leading zirconium suppliers got that warning from General Electric when they were called in for one of a series of seminars seeking cost-reduction avenues. (Meanwhile, though Allis-Chalmers announced that aluminum was preferred, but that development work had not progressed enough to make the new alloy 8001 available for use in the initial core loading of the Northern States Power Co. project.)

A NEW GRAPHITE PROCESS, combining carbonization and graphitization steps in a single heating and cooling cycle, substantially reduces the time and cost of making molded graphite for use as a moderator in nuclear reactors, the AEC announced recently.



"Nautilus" submarine alumnus are part of this group of 18 trainees who are being given an 11-week schooling session at Lincoln, Nebraska, to prepare them for operating The Consumer Public Power District's Hallam Nuclear Power Facility. Like CPPD's 12-man supervisory staff at the "Sheldon Station" Steam Plant, the 18-man crew will follow the Lincoln training with an 11-week session at Atomics International's Cal. facilities.

A WASTE DISPOSAL INCINERATOR designed for General Electric is expected to reduce the costs of contaminated waste disposal from GE's San Jose fuel manufacturing operations by 75-percent.

MARINE WASTE DEPOSITS from one to eight years old were checked recently by the AEC to learn the condition of disposal drums. An underwater television camera was employed for this purpose for the first time in observations of the site (no longer in use for disposal) 15 miles off Boston Harbor in Massachusetts Bay.

NUCLEAR DATA CHART, "a modification of the periodic table to meet the needs of persons engaged in nuclear design work, particularly those involved with various aspects of reactor technology" is available from Westinghouse for $1 a copy. The useful wall chart was designed by Dr. W. E. Shoupp.

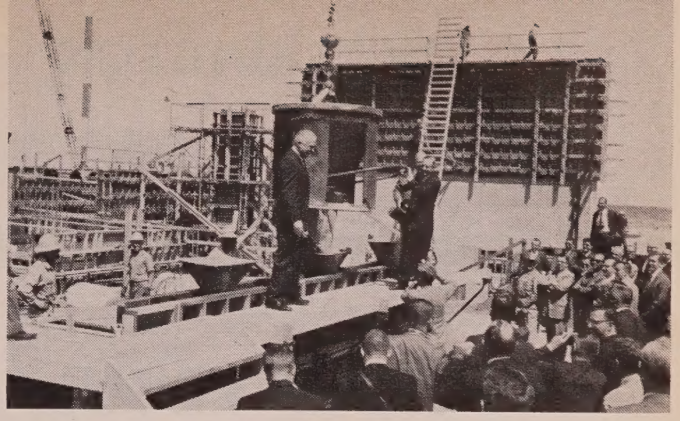
WASTE DISPOSAL INTO THE SEA may be safe under controlled and specified conditions, but only low and intermediate activity levels, an international panel of experts has concluded, according to the International Atomic Energy Agency.

NEARING $1-BILLION is the total estimated costs for all civilian reactor projects now actively under design or construction, the AEC reports. The figure as of Mar. 31 this year was $928.6-million, with some $507-million of these costs remaining to be incurred.

ARE YOU USING AEC INFORMATION *effectively?* In its series of regional meetings for access permit holders, Commission personnel are asking this question, adding: Why are we going to all the trouble of conducting the Access Permit Program if it is not, in fact, being used? "Surprising" to the AEC is the "minimum use of documents at the Commission's classified libraries" . . . and the fact that, of 890 permittees, 504 have never purchased classified reports. Yet, they conclude, the Access Permit Program is going to be used "as long as there are categories of classified information which industry needs."

"THE ATOM IN YOUR COMMUNITY?"—It's the title of a new pamphlet being distributed by the U. S. Chamber of Commerce to help business men tell their neighbors about the peaceful side of the atom. Write the Chamber for information about it, as well as about the 16-mm color film, "The Atom Comes to Town."

Press conference conducted by Consumers' Pres. James H. Campbell (at right) offers discussion by panelists (l. to r.): GE's Dr. Lyman Fink, Bechtel's James N. Landis, the AEC's U. M. Staebler.



Start of major construction on Consumers Power Co.'s Big Rock Point nuclear power plant is marked by symbolic cement pouring ceremony. Consumers Pres. Campbell is at left, AEC's Loren Olson at right.

For Newest A-Power Project Underway, in Michigan

Consumers Power Co., Commits $27-Million; R&D Goal: Test of High Power Density

For a project testing a nuclear powerplant design that "might be close to the design" which will be first to produce electricity under conditions economically competitive with conventional plants, Consumers Power Co. has committed the largest sum of money this Michigan utility ever set aside for research and development. The R&D cost of $10-million is nearly a third of Consumer's $27.7-million estimate outlay for its Big Rock Point nuclear electric generating station on which major construction got underway in mid-July.

Consumers signalled this step in its progress with the project near Charlevoix, Mich. by staging a brief ceremony and inspection tour for company, local and state officials and representatives of industry and labor. Representatives of General Electric and Bechtel, partners in the experimental nuclear project, joined Consumers in the presentation.

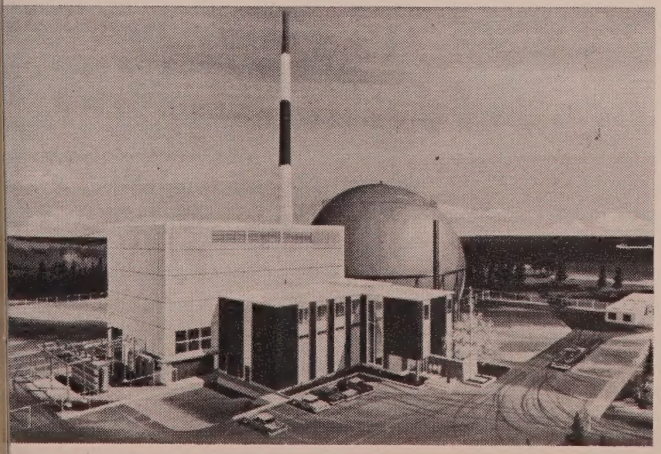
The plant will utilize a direct-cycle, forced circulation boiling water reactor design. Principal aim of the R&D effort at Big Rock Point will be to develop and utilize a reactor core that will increase the plant's initial kw output of 50,000 by 50-percent. Object of the program will be to achieve the advantages of high power density in the boiling water reactor design without introducing other complications—such as higher fuel fabrication costs.

The Consumers project will not be the largest boiling water unit, of course, but like the 180,000-kw Dresden station now operating on the Commonwealth Edison system, the Big Rock Point plant is privately financed. However, The Atomic Energy Commission is supporting the project in the area of R&D, to further the national program for making nuclear power competitive at the earliest possible time.

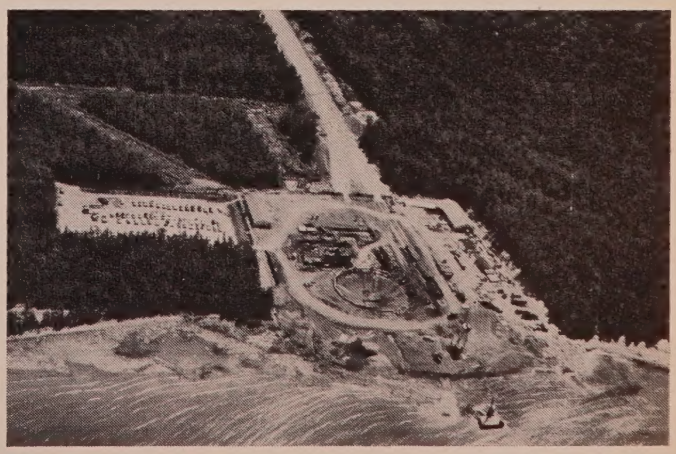
Consumer's Pres. James H. Campbell emphasized in his remarks at the recent ceremony that the task is not being undertaken because the company wants to "own a nuclear plant for glamour." Instead, he said, "We believe that the new plant will serve a useful purpose that is meaningful to our customers and stockholders . . . and at the same time it will advance nuclear science and technology."

Explaining this, Mr. Campbell pointed out that the site in the upper part of Michigan's Lower Peninsula was selected because new capacity will be needed in this area by the mid-60s, though probably not before. Thus, the desired research and development effort can be carried out in the time between late 1962 (when the Big Rock Point plant is expected to be in operation) and

(Continued on page 37)



Artist's conception of the completed Big Rock Point nuclear power plant, as it is to appear when completed in the fall of 1962.



Bird's-eye view of Big Rock site on Lake Michigan shore shows construction in mid-July, including crater for reactor vessel.

by EPH KAHN
Washington Correspondent

FEDERAL REGULATION OF SAFETY?

The safety record of electric utilities has been sharply scored by Rep. Thomas L. Ashley (D., Ohio), who also urges federal intervention to set safety standards for the industry. Ashley charges that electric utility employees, with broad responsibilities for their own safety as well as that of their co-workers, do their jobs under the "serious handicap" of "inadequate safety measures and out dated safety equipment."

Ashley's timing in putting this rather lengthy and detailed criticism into the Congressional record —when Congress was driving pell-mell toward recess—was not the best. But it does lay the groundwork for a drive toward action in the next session, not to mention providing a solid base for election speeches this fall. Though hardly likely to inspire much immediate demand for Congressional action, this attack does indicate the sort of troubles that the electric utility industry may be in for in the future.

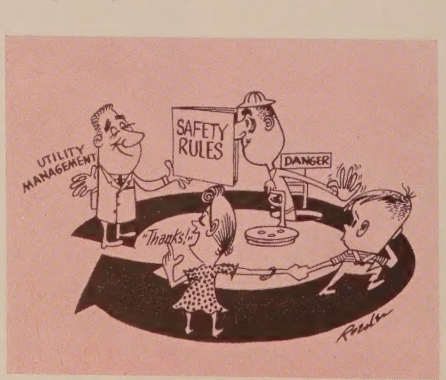
In the past, Congress has generally taken the view that the states are capable of setting adequate safety standards for their citizens at work. There are, however, some notable exceptions, such as the Coal Mine Safety Act and other laws. If enough hullaballoo can be raised, an Electric Power Safety Act might be passed.

So radical a proposal would inevitably invite a good deal of opposition. But it seems clear that many organizations that do little more than distribute power at low voltages could afford to support a federal safety code. They would pay only a minimum price in terms of cost and inconvenience.

Another possibility—and one which is no more Machiavellian than other schemes seen in the Congress in recent years—might be to trade off federal safety standards for a hands-off policy in regard to some other federal practices in regard to electric power.

Be that as it may, it seems appropriate to look at the proposals advanced by Rep. Ashley. They are far-reaching, and they would in certain respects, at least, apparently force abandonment of some new techniques for dealing with outages quickly, efficiently, and with minimum unnecessary interruption to service. Here are some of the Congressman's proposals—and some of his comments about the utility industry's approach to the safety problem:

In the electric utility industry, it is essential that limitations be placed on the number of consecutive hours worked, that certain procedures be established and followed in de-energizing electrical conductors or equipment for maintenance purposes, and that safety requirements be established for work within contact distance or for equipment energized at a high voltage. "This giant industry, while striving to satisfy the increasing demands of its consumers by expanding the systems of distribution and modernizing the techniques of generating power, has failed for budgetary or other reasons to demonstrate a proportionate concern for the safety of its employees. Thus, voltage limitations are designed for the lower primary voltages of a bygone era and enclosures of modern high speed generators and turbines do not provide adequate protection from moving parts."



As Ashley sees it, the "neglect" of the electric utility industry is readily visible even when admittedly incomplete safety records are examined. He notes that EEI members alone reported 136 fatalities in 1955—an "alarmingly high" number. Figures for non-members (REA's, municipalities, etc.) are not readily available, Ashley observes, though he finds it easy to conclude that "one can easily imagine the impact their statistics would have on the overall picture." This is, no doubt, true provided one can also imagine the statistics. And, of course, an unusually low accident rate in this group could knock the statistical wind out of Ashley's demand for federal meddling.

A relatively high rate of permanent impairment as a result of utility accidents is noted by Ashley. In his opinion, "the accident rate itself is compelling reason for consideration of legislation to establish a uniform code of safety regulations for the electric utility industry." Economic loss, a collateral aspect, is also "staggering."

As a first step, Ashley would establish uniform minimum safety

(Continued on next page)

EL&P's Washington column in this issue has been written by Mr. Kahn, because of the illness of Ralph Elliott. Mr. Elliott, who has contributed to EL&P from the Washington scene for 24 years, is expected to resume his assignment within a few weeks.

Washington . . . Cont'd

tandards in the utility industry. The present safety record and the miserable failure of many companies to follow adequate safety procedures are evidence enough of the need for industry-wide safety regulations." Such regulations could be either statutory requirements or be prescribed by a government agency. Ashley believes that the law itself might be used for basic rules—such as limitation on the number of consecutive hours worked, materials used for protection of wires, and so forth—but "the establishment of a safety agency would appear to offer several advantages." Such an agency, staffed with people familiar with the electric power field, "would be competent to establish effective safety regulations and because of its continuing responsibility in the field would be able to modify and streamline safety requirements to keep pace with technical innovations."

Ashley also plumps for "adequate inspection" of both plant and safety equipment. In cases of immediate hazard, Ashley would permit the new safety agency to order the removal of workers from the area as well as order corrective action.

The third arm of this projected safety program for the electric utility industry would be comprehensive accident reporting, with investigation of every fatal mishap and spot checks of others by trained personnel.

According to Ashley, "voluntary action by individual companies has, to date, been inadequate and unsatisfactory. Employee-company safety committees are desirable but hardly the answer to a nationwide problem. It would appear, therefore, that the existing accident record in the electric utility industry calls for responsible government action. In the absence of an effective industry program, it is only at the government level that safety standards can be instituted and enforced. Creation of a new government regulatory agency or additional authority delegated to an existing agency is necessary . . . Provision could thus be made for such a safety agency and a board of review to be staffed by company and worker representatives."

Big Rock Pt.

(Continued from page 35)

the time when its output will be required to meet anticipated demand in this region.

Mr. Campbell further revealed the utility's reasoning this way:

It is our belief that atomic energy for electric power generation ultimately offers a good likelihood of becoming economically competitive. Consumers Power Co. is glad to contribute in this rather important way to the advancement of the broad program laid out by the Atomic Energy Commission for the development of nuclear energy in the United States."

Representatives of General Electric, Bechtel and the AEC participated in a press conference conducted by Mr. Campbell in connection with the ceremony. (GE is designing and building the reactor, Bechtel is serving as engineer-constructor of the project.)

Ulysses M. Staebler, assistant director of the AEC's division of reactor development, observed: "We will learn much from this project that will help solve problems in the development of this type of reactor."

Bechtel's Vice President James N. Landis described the Big Rock Point project as "the neatest, tightest package yet tied up in the atomic power field." And, for its size, he added, this will be the fastest job built to date, because of the accumulation of experience with boiling water reactors.

Mr. Landis noted these important factors in keeping costs down: (1) the agreement of Consumers to accept loss of the plant's output in the event of shutdowns (for research and development purposes), rather than to require the use of standby equipment to maintain service continuity; and (2) Consumer's willingness to "tie down" the conceptual design at an early stage.

Dr. Lyman R. Fink, general manager of GE's atomic products division, remarked: "Projects such as the Big Rock Point may not steal the headlines across the country in the next five years, but . . . projects like this will be responsible for bringing abundant power to the world in the years to come. Atomic energy is in the stage where technical refinement, devoid of great public appeal and drama, will bring this field to the point that it will fulfill past dramatic predictions. And, this project is a practical example of what can be accomplished through effective cooperation of the utility industry, electrical manufacturers and the Federal government."

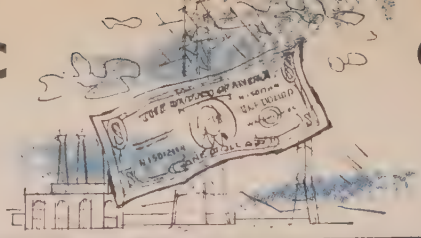
Dr. Fink explained that the R&D target of demonstration that the Big Rock Point plant can be operated satisfactorily at 75,000-kw with fuel operating at an average power density of 45-kw per liter of active core while permitting an average exposure of 10,000-megawatt days per ton compares with the Dresden Station's average power density of about 30-kw per liter of active core. Significant cost reductions in fuel fabrication is expected from this, predicted Dr. Fink, as well as from a second target: to demonstrate that it is feasible to operate a reactor capable of supplying sufficient steam for a 300,000-kw plant with fuel having an average power density of 60-kw per liter of active core and permitting an average exposure of 15,000-megawatt days per ton.

In his remarks for the two-day presentation, Consumer's Pres. Campbell referred several times to the rising costs of conventional fuel in this area. Noting that Consumers is now using about 10,000 tons of coal a day, with annual fuel costs for the system running around $30-million, he revealed that a study shows that the utility's aggregate coal costs (assuming no use of atomic energy) over the next 35 years would exceed $6-billion. With this prospect, he said, Consumers "must be interested in and devolop any fuel which offers reasonable prospects of reducing our fuel costs."

Mr. Campbell indicated that the Michigan regulatory commission had been most cooperative in its viewpoint regarding Consumer's plans for spending the biggest single R&D amount in its history.

Mr. Campbell emphasized another point: "While we are responsible here for one of the very few nuclear power projects sponsored by a single utility company, this commitment does *not* indicate Consumer's lack of faith in the eventual development of the breeder reactor (which is being tested in the Enrico Fermi project, supported by a group of private utilities including Consumers.)

ECONOMIC OUTLOOK



By A. C. Farmer
Economic Consultant

Flight From The Dollar

In a discussion that appeared under the above topic in Electric Light and Power, July 1, 1959, page 38, the following definition appeared:

> "A flight from the national currency implies a conviction on the part of the public that the country is facing a period of price inflation in which the purchasing power of the currency continuously will be reduced."
>
> The following conclusion was reached:
>
> "A flight from the dollar of serious proportions is not at this time a reasonable expectation."

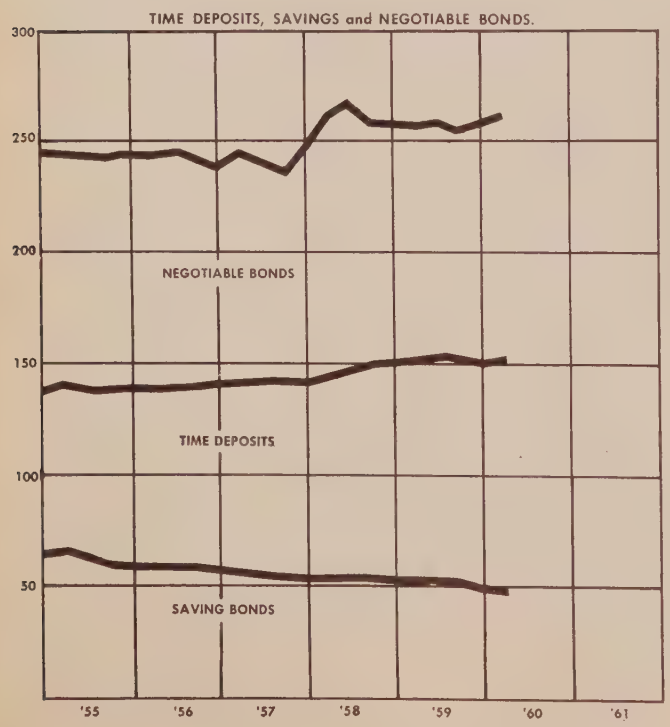
In the intervening period, a new economic factor has been introduced and that factor is the possible loss of the gold stock of America on a scale sufficiently large to make a flight from the dollar a serious possibility.

Serious concern in this respect is expressed by the conservative and scholarly American Institute for Economic Research. The following is quoted from their Investment Bulletin dated May 2, 1960:

> "In the January 4, 1960 *Investment Bulletin*, when discussing the gold situation, we said, 'Today the Nation's actual gold reserve after deducting net foreign claims approximates $2.0 billion. The 1959 decrease was nearly $5.0 billion. Obviously a continuation of the trend will bring the Nation to the brink of unsolvency, from an international point of view, within 6 months.
>
> " 'The risk of an external flight from the dollar is steadily increasing. We do not see how anyone can predict with assurance such a flight, much less its timing. But this threat hangs like a sword of Damocles over the Nation's economy. . . . the danger was not averted, and it increases daily.' "

FIXED INCOME SECURITIES AND TIME DEPOSITS

	NON-MARKETABLE SAV. BONDS	TIME DEP. COMM. AND SAV. BANKS	NEGOT. BONDS N. Y. STOCK EXCHANGE	TOTAL
	DOLLARS IN BILLIONS			
Dec. 1954	63.6	75.3	16.5	245.4
Mar. 1955	64.0	76.2	104.3	244.5
June	61.6	77.1	104.3	243.0
Sept.	60.0	77.4	104.5	241.9
Dec.	59.2	78.4	104.8	242.4
Mar. 1956	59.0	79.3	103.8	242.1
June	58.7	80.6	104.3	243.6
Sept.	58.5	81.3	100.6	240.4
Dec.	57.4	82.2	99.0	238.6
Mar. 1957	56.7	84.6	101.6	242.9
June	55.7	85.7	98.5	239.9
Sept.	54.8	87.7	93.5	236.0
Dec.	53.4	89.1	106.1	248.6
Mar. 1958	53.1	92.5	114.8	260.4
June	52.9	95.5	118.3	266.7
Sept.	52.8	97.2	107.7	257.7
Dec.	52.1	97.9	105.9	255.9
Mar. 1959	51.9	99.5	106.6	258.0
June	51.4	101.0	105.9	258.3
Sept.	50.6	101.5	103.5	255.6
Dec.	48.9	101.8	105.4	256.1
Mar. 1960	48.4	102.2	109.7	260.3



The three largest items of fixed income securities are: savings bonds, negotiable bonds, and time deposits.

The tabulation and the chart show to date no evidence of any flight from the dollar. The only contraction has been in the steady decline in the volume of Savings Bonds. (This decline, however, has been the result of the smaller interest rates earned by these bonds, which has made them unattractive.)

The business situation at this date in 1960 decidedly is unfavorable, and since 1960 is an election year, a reduction in interest rates by the Federal Reserve Bank to stimulate business activity appears extremely probable.

To deal with the probable loss of gold and possible flight from the dollar that might result from such action, the U. S. Government has the alternative either of further devaluation of the dollar or of requesting foreign governments to refrain at this time from pressing their claims on the United States gold stock. Such a request undoubtedly would be successful, since it would be against the self-interest of all friendly governments to play into the hands of Russia by precipitating a domestic gold crisis for America.

Even if such action is taken, the threat of a flight from the dollar described so clearly in the quotation from the bulletin of the American Institute for Economic Research still will remain until a permanent solution is found for the gold problem.

No Flashover Here

Silicone Coating Prevents Power-Stealing Leakage

st, fog, salt spray and other moisture "beads" harmlessly on insulators ated with Dow Corning 5 Compound.

w Corning 5 Compound offers easy-to-apply, economical protection t prevents insulator damage, reduces service interruptions, and lowers ulator maintenance costs.

re's how: Dust, dirt and other airborne contaminants that settle on ulators are quickly engulfed and completely encapsulated by water-elling silicones. No power-stealing leakage paths can form.

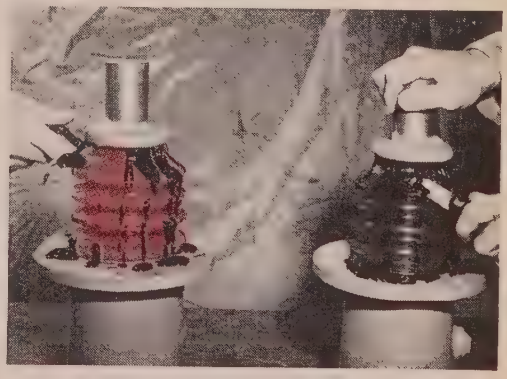
w Corning 5 Compound can be applied to insulators by hand, brush, spray. It will not wash off, run off in hot weather or turn waxy in l. A single application can remain effective up to five years and longer.

all the facts on Dow Corning 5 Compound as an insulator coating, how it reduces outages, flashover and maintenance, write Dept. 2709.

Reduce Cleaning Costs & Outages

The most stubborn contaminants are easily wiped off silicone treated insulators. Silicones make it unnecessary to use solvents, steel wool or wire brushes . . . or to remove insulators from their mounts for cleaning.

One Midwest utility formerly had to disassemble all the insulators of a 35.5-kv substation located near a cement plant three times a year for a thorough scrubbing with solvents and steel wool. Silicone treated, the same insulators are now merely wiped off with a dry rag every six months and 5 Compound reapplied . . at a small fraction of the previous cost in materials, labor, and outage time! Other utilities report similar savings.



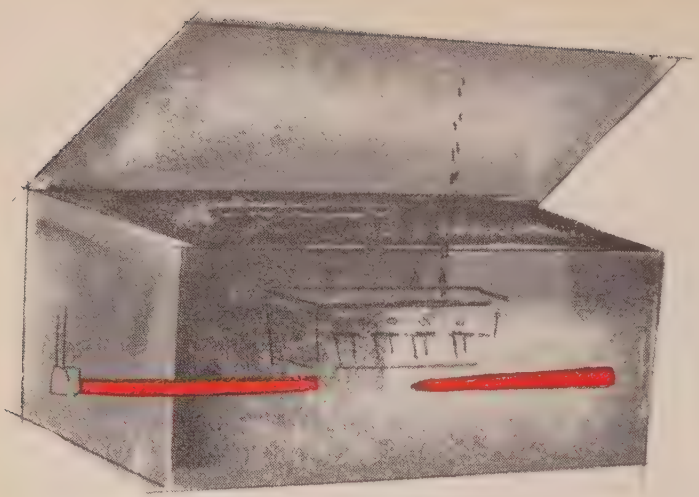
Here's another use! Before filling potheads, coat the terminal bushings with Dow Corning 5 Compound. Any overflow of the filling material will strip easily from the pothead bushings. In contrast, overflow frequently must be chipped and scraped from untreated bushings.

The nearest Dow Corning office is the number one source for information and technical service on silicones.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.



Heating of caustic solution with electricity revolutionizes a small Canadian industry.

By Andre Martel
Commercial and Industrial Representative
The Shawinigan Water and Power Company
St-Joseph, Cte Beauce, Province of Quebec, Canada

ELECTRICITY TAKES OVER IN HEATING CAUSTIC SOLUTION

OPERATING COSTS, labor saving, cleanliness—all proved to be in favor of electricity for heating caustic solution used by a small Canadian industry to remove dirt, grease or rust from vital parts of automobile and truck motors prior to making major repairs.

La Compagnie Beauce Moteurs Enrg., St-Georges-de-Beauce, P. Q., was looking for a means of performing this operation that would be not only clean, fast and economical, but highly efficient, because on the success of this operation depends the quality of the jobs.

This company specializes in motors using combustible of all kinds. Such a business must have specialists to carry out this work, because adjustment and final work is of great importance.

The first important step is to clean the motor perfectly before putting it back and changing the worn out parts, as it can be understood that any dirt, grease or rust must be removed from vital parts, if adjustments and guaranty for the job are to remain on a paying basis.

Previous procedure was the use of a portable oil-heated boiler which heated the caustic solution. Heat loss was such that this process was conducted outside in order not to impair other employees at their work. In order to meet the demand, of four motors repaired per day, it was necessary to keep a man on this cleaning job the whole day, which took an average of two hours per motor cleaned.

This arrangement was, to say the least, costly and unpractical since it was necessary to use a complete barrel (45 gallons) of caustic solution per week. Evidently, the proprietor was looking around for some more modern process which would be clean, fast and more efficient to do this job. In cooperation with the author of this article, the possibility of using electricity was studied as a source of heat, and one which would do away altogether with the use of the old arrangement.

After preliminary studies of different methods of applying electric heat, it became evident that immersion elements in the reservoir containing the caustic solution would be recommendable. These elements would have, of course, to stand this solution, and the use of immersion heaters made in stainless steel and inconel, was evident.

Figures showed that for a reservoir containing 400 gallons of this solution, two 5-kw heaters would be sufficient to maintain the temperature at 180 F. In order to keep the heat losses to a strict minimum this tank was constructed of steel and two inches of insulation was installed all around the tank.

Inside dimensions are 6′ x 4′ x 4′ which permits immersion of three automobile motors or two truck motors, or one or two tractor motors. Of course the temperature is maintained by the use of a thermostat in connection with a magnetic contactor. In order to keep the electric demand to a minimum, use was made of a reversible switch in connection with a 12-hp electric welder against the two 5-kw elements and a 3-hp air compressor.

This arrangement does not alter the work in this industry in any way, particularly because the welding machine is used only a few hours per week.

A 30-gallon electric water tank provides hot water for removing the solution.

Advantages Of New System

(a) Increased Output

With the old method, it took an average of two hours per motor to do the cleaning. With the new method, three motors can be cleaned in the same time and at the same

ime. This means that at least 15 motors per day can be cleaned as against eight with the former method.

b) Quality

It is evident that by submerging he motor in the caustic solution hat all conduits and orifices can be ompletely cleaned and all the mudge can be removed.

c) Handling Facilities

Since the adoption of this new ystem, only the switch has to be ut in operation, as against the ransport of mobile oil burner, team boiler and motors at the exerior of the building. A small rane immerses the motors in the olution, and two hours later they re removed.

d) Comfort and Cleanliness

During the winter particularly, it as been appreciated by the man oncerned that this job could be one inside. The general atmosphere in the shop is cleaner.

The arrangement for cleaning the ank itself is as follows: A drain is laced 12″ from the bottom to reove the unsoiled caustic solution; he second drain is at the bottom to ermit the cleaning of the tank.

e) Economy

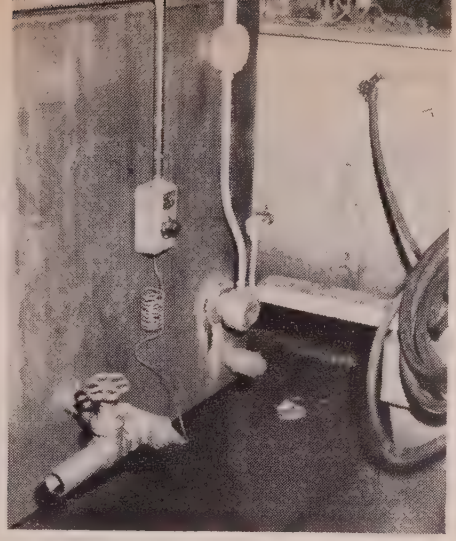
The first large economy realized y the proprietor was in the conmption of the caustic solution: gallons per week as against the me quantity of caustic solution r six weeks. This also means that e saving in the solution alone will y the electrical consumption for out six months.

The second economy is realized the fact that today one-half manur is required as against two an-hours with the old; therefore man's salary was saved.

Customer Viewpoint

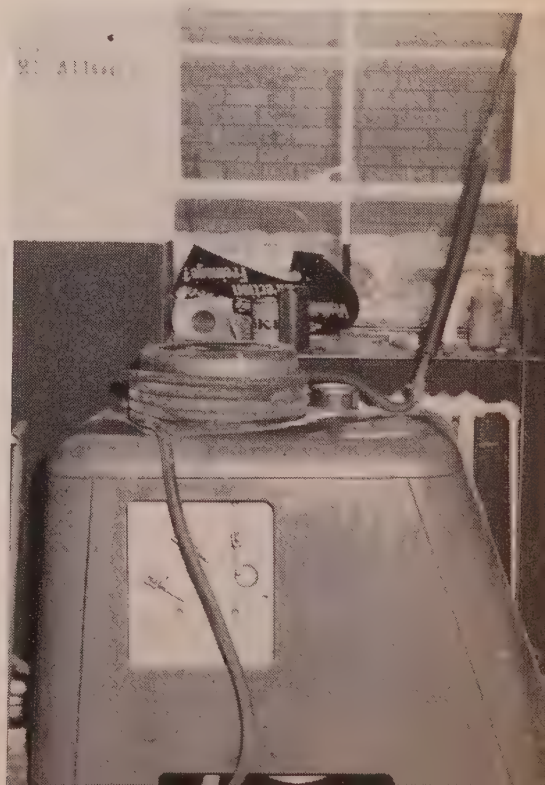
The proprietor of La Beauce Mors Enrg. is very satisfied with new system from the standpoint operating cost, labor saving, and anliness. He only regrets one ng: not to have made this instalion a long time before.

The new method is not only three es as fast as the old, but the ality of the work has brought wn the cost of this operation ne to one-fifth of the former cost.



End view of tank showing one of the two 5-kw heating elements, the thermostatic control element and the two drains at different levels. On right is hose for hot-water supply used to remove caustic solution from cleaned motors.

Electrically-heated steel tank containing 400 gallons of caustic solution for cleaning automobile and truck motors prior to making major repairs.



Portable oil-heated boiler previously used to heat the caustic solution.

Soil Compaction By Explosives Cuts Tower Costs on Project EHV

Soil compaction through use of explosives, a construction technique previously employed in building dams, was used in preparing the foundations for the portal-type towers for Project EHV.

By adapting this soil compacting procedure to foundations for power transmission towers, engineers of Stone & Webster Engineering Corp. estimated that sufficient compaction to meet design requirements for the use of spread footings would be obtained at costs lower than if driven pile foundations were used.

Average steel weight of the three portal-type towers to be furnished by American Bridge Div. of U.S. Steel Corp. will be about 130 tons each. The towers are designed so that their entire weight rests on four pinned supports—two for each leg.

Studies of the site along East New Lenox Rd., above the Housatonic River southeast of Pittsfield showed that the soil consists of loose, fine, fairly uniform sand to depths of more than 100 ft. Both driven piles and spread footings were considered as possible foundation types. Since there was no material at reasonable depth which could be used as a bearing stratum, all pile loads would have to be resisted by friction. This would result in long piles and the possibility of unacceptable differential settlements.

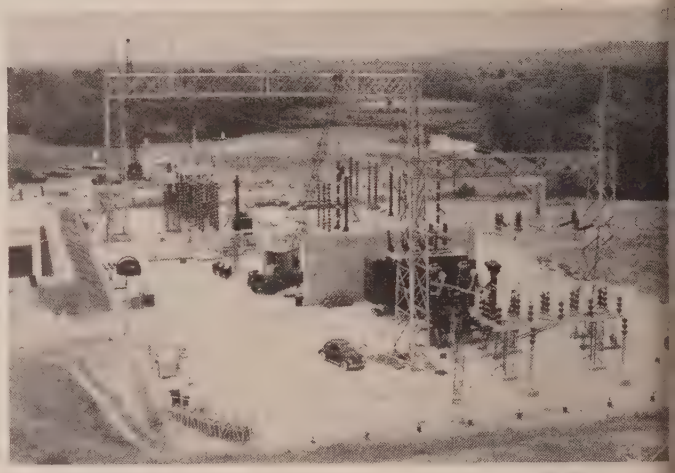
Preliminary tests indicated that the soil could be sufficiently compacted using explosives to allow a design bearing value of 4000 psf with anticipated settlements within acceptable limits.

Over a period of 30 to 40 days, a series of small but multiple dynamite charges were set off at the foundations site of each tower leg. Charges ranging in weight from one-half to four lbs each and totaling as many as 30 at one time were exploded at depths varying from six to 13 ft below ground. Consecutive blasts were carried on over a week's time for each tower leg, providing time for measurements and settling.

Install 38 Miles of Al Rigid Duct

The largest application of aluminum rigid conduit in the West—some 38 miles in all—is scheduled for the Wanapum Dam development near Vantage, Washington.

Installation will be done by the Engineering & Construction Co. of Pocatello, Idaho, using conduit from one and one-quarter to five in. in diameter, supplied by Kaiser Aluminum & Chemical Sales, Inc.



With station structure erected and most of the apparatus installed, North Station at General Electric's Project EHV approaches completion. Station and short section of line are scheduled for fall energizing at 460 kv. At right are the 115-kv disconnects, air-blast breakers and a 40-mva regulating transformer. A 650-kv (750-kv maximum) power transformer will be installed on the far side of the concrete wall in front of the other EHV apparatus. Headquarters building at left has control and elaborate data gathering equipment. Beyond the substation, the truss for the first of the three huge portal towers is being fabricated on the ground. These steel towers, weighing up to 135 tons each, permit great flexibility in testing various conductor sizes, configurations and spacings.

A Successful 13 Years With Mobile Subs

Experience of San Diego Gas & Electric in the areas of emergencies, operation, maintenance, and construction demonstrates there is a place for mobile substations in a company of average size, said SDG&E's C. D. Mack at the recent AIEE Summer General Meeting.

The company uses mobile substations at voltages of 69, 12, 4, and 2.4 kv. It has two 12-kv mobile substations, one 69-kv mobile transformer, and a 4-kv mobile regulator. Its first mobile substation was put in service in October, 1946. Connecting a mobile unit in a substation on the San Diego system is simplified because of standardized phase-angle orientation, open-rack construction, and because flexible, single-conductor cables are used. Unusual installations are planned in advance when time permits, but operations which have become almost routine, and emergencies, are improvised in the field.

"When a maintenance program is working effectively, mobile units are seldom needed for emergency service. For 13 years, the San Diego Gas & Electric Co. has so successfully coordinated the use of mobile substations that approximately 70 percent of the service from this equipment has helped reduce the cost of new construction," he commented.

ECONOMIC POOL DISPATCH WITHOUT CENTRAL CONTROL

By L. L. LINDER,
System Operator,
Iowa Southern Utilities Company

Five Iowa companies buy and sell economic power on the basis of scheduled quotations to realize pool benefits without the expense of central dispatching.

SINCE July 1, 1958 five Iowa utility companies have been deiving the benefits of economic pool ispatching without central control. lthough they operate their power upply as one company, there is no entral dispatching office or auority and no company has surendered its individuality or entity. ather, each company functions inependently as buyer or seller, deending upon "ticker tape" quotaons from others. And, scarcely an our goes by without two or more mpanies exchanging economy ergy.

Administration

Administration of pool affairs is e responsibility of several comttees composed of representatives pointed by member companies. e relationship of these committo the Administrative Committ, which supervises all pool funcns, is shown in Fig. 1.

One of the first decisions of the ministrative Committee was that Iowa Pool should be operated the dispatching organizations aldy established by each company. is would eliminate the need for l expense of a central dispatchorganization.

Operating Committee

Establishing methods and proceds to be used by each of the five panies in preparing operating maintenance schedules, con- and operating procedures, and methods used in interchange accounting was the responsibility of the Operating Committee. Preparation of an Iowa Pool operating manual covering all phases of pool and interconnected systems operations was also the work of this committee.

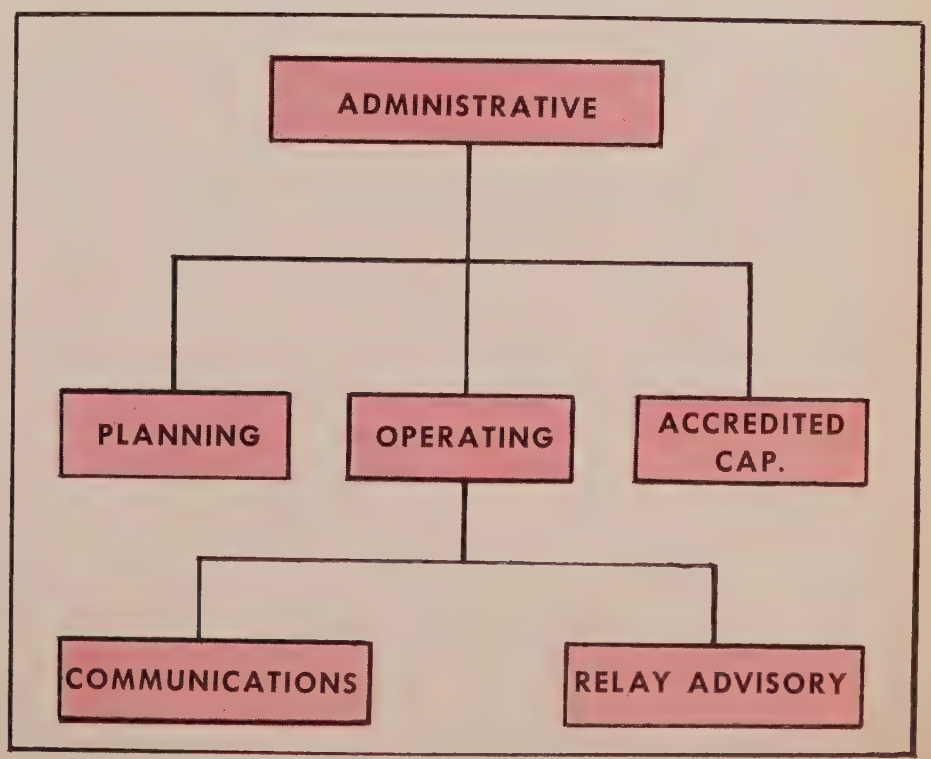
The operating manual has been a very useful reference source for load and system dispatching groups. It contains the interconnection agreement, rules for maintenance scheduling, energy transaction, spinning reserve, equipment outage reporting and loop accounting. Also included are sections on generating station sizes and locations, area control information, interconnected systems information, and the Iowa Pool one-line diagram.

Members of the Operating Committee are directly responsible for training their own dispatching organization in Pool operating procedures.

Pool Communications

The principal method of communication for dispatching is by full-time leased teletype service. Initial cost was low, it could be installed in a very short time, and it would permit a delay in establishing permanent communication facilities until a long-range study could be completed. While at first

Fig. 1—Organizational relationship of the Iowa Pool committees.



or's Note—This is adapted from a paper ented by the author at the 1960 Engineer- Conference of the Missouri Valley Electric ciation.

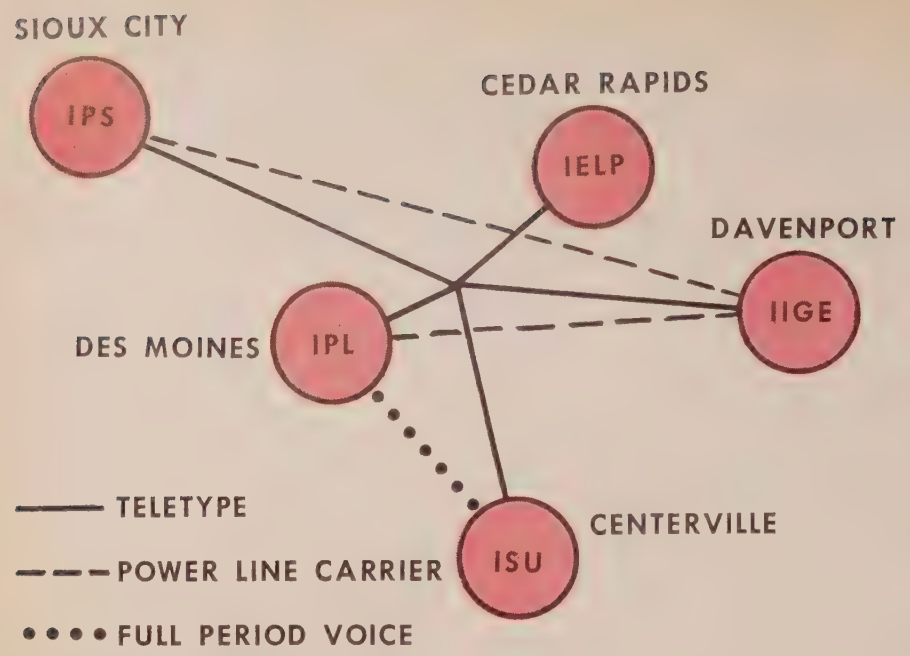


Fig. 2—Location of dispatching offices of the five Iowa Pool companies and methods used for communicating pool information.

no one considered teletype to be more than a stop-gap measure, it has been very satisfactory from the standpoints of operating costs and quality of service. Not one of the five companies would now be willing to give it up.

Other forms of communication currently in use are full-time leased telephone service between Iowa Southern Utilities Company and Iowa Power and Light Company, power line carrier telephone between Iowa-Illinois Gas and Electric Company and Iowa Public Service Company, and power line carrier between Iowa Power and Light Company and Iowa-Illinois Gas and Electric Company.

Most of the telemetering of boundary tie quantities back to the control rooms is done over power line carrier. Leased telephone circuits are used entirely for telemetering by Iowa Southern and operation has been satisfactory. Location of five offices and communication facilities are shown in Fig. 2.

At present, companies are studying feasibility of using microwave for individual company, intra-company and pool use.

Spinning Reserve

Member companies maintain sufficient spinning reserve to cover loss of the largest unit, currently the 90-mw unit at Council Bluffs. The amount of each participant's spinning reserve responsibility is determined by the ratio of his accredited demand to the total of combined demands.

If one company loses a unit and needs help the dispatcher can notify other pool members at once and call for replacement emergency energy for a certain size unit. By using values already set up in a table of emergency energy responsibilities, the dispatcher can immediately set his controllers to take in the energy required, and other dispatchers immediately set their controllers to feed the correct amount of energy out. Integrated mwh's for billing are determined after the emergency is over and are based on mw flow and duration, at 12.5 mills per kwh.

Because of the speed of comunicating by teletype and the thorough training of dispatchers, emergencies within the pool have been handled with a minimum of time lag between occurrence of the emergency and utilization of the pool spinning reserve.

Loop Accounting and Billing

The Iowa Power and Light Company serves as loop accountant for the Iowa Pool and for other companies of "Group G" of the interconnected systems shown in Fig 3. Each company in "Group G" sends a daily report of hourly schedules and hourly boundary tie line meter readings and hourly unintentional flows. IPL then reports daily for the group to the "Southwest Loop Clearing House" at Little Rock, Arkansas. Solid lines in Fig. 3 show boundaries of "Group G," dotted lines show boundaries of the Iowa Pool.

A typical daily loop accounting sheet used by one of the Iowa Pool companies is shown in Fig. 4. Each of the columns representing a boundary tie scheduled or metered quantity is numbered to facilitate cross checking by the Loop accountant. The difference between total energy debits and total energy credits for any given hour is the "regulating" or "unintentional" energy flow for the hour.

Billing in the Iowa Pool is done by individual company. A report of pool expense, energy transactions, and accredited demand is submitted monthly by each participant. These items together with accredited capacity charges and credits are incorporated into a pool billing statement issued by IP&L. From this, each company bills the other four for any charges due. Pool expense such as teletype service, salaries, and supplies charged to the pool by IP&L are shared by each company according to the ratio of its accredited demand to total pool accredited demand.

Advance Interchange Scheduling

Weekday operating schedules are prepared one day in advance, and weekend schedules are prepared on Friday. The process of preparing each day's schedule falls into three general periods, as follows:

1. Before 1130 each day, each company prepares a 24-hour load forecast for the following day which includes estimated native load plus any scheduled firm sale or purchase. Then, on the premise that no Pool economy energy transactions will be made, each company using its own available capacity prepares a cost forecast for the morning, afternoon, and evening peak hours.

2. At 1130 an economy cost survey is conducted on the teletype, at which time each company quotes its incremental cost for energy in blocks of 10-mw for as many blocks above its load as it has available capacity. Each company also quotes its decremental cost for as many 10-mw blocks as tie-line capacity and other conditions will permit

cheduling in. A typical economy ost survey is shown in Fig. 5.

From this cost information, each ompany schedules economy purhases or sales for the greatest savgs as indicated by the cost quotaons. It is customary for the ompany with the lowest increment sell to the company with the ighest decrement for maximum verall pool benefits. This results scheduling the lowest cost units the pool and aids in keeping all inning capacity loaded to the me incremental cost.

Quotations given in Fig. 5 reveal at Company "C" has the lowest cremental cost and the most caacity available. We would expect this situation that schedules ould be set up between C and E, and A, C and D, and C and B in at order. Company B shows a caacity deficiency and would probly schedule its entitlement of ualization energy from the other ur companies.

3. At 1530 each day a "Peak Prered for" survey is conducted on e teletype to determine how efctively scheduling has been done keep off high-cost units and to ep spinning reserve to the minium required amount. See Fig. 6. his survey shows for each comny the scheduled conditions for orning, afternoon, and evening ak periods for the following day. olumns 6, 7, and 8 of this survey e helpful in encouraging additional hour to hour economy energy transactions which is frequently done by shifting the load to the lower-cost system and the spinning reserve to the higher-cost system.

Types of Energy Scheduled

There are three types of energy which can be scheduled in the Pool: *emergency, economy,* and *equalization* energy. Use of *emergency* energy and its 12.5-mill rate have been discussed. This energy is purchased only long enough to allow some lower cost generating capacity to be brought on or a schedule for purchase of lower cost energy to be arranged.

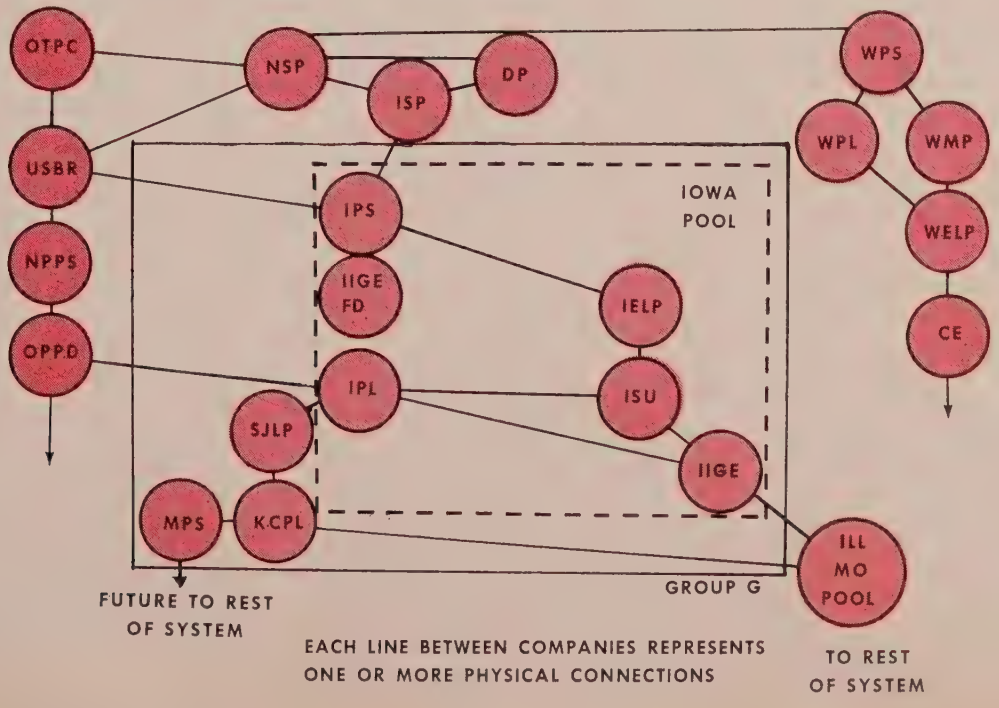
Economy Energy is the most common type of energy transaction within the pool. Billing price for this energy is determined by averaging the buyer's decremental cost and the seller's incremental cost. Factors determining incremental costs are incremental fuel cost, incremental maintenance cost, incremental labor and supplies, and incremental line loses to the point of delivery. Each company uses its own system for determining these costs and provides its load dispatchers with appropriate tables and cost figures to facilitate preparation of daily and hourly schedules and cost quotations.

Two types of economy energy transactions are common, Type "A," which is "Immediately Cancellable," and Type "B," which is "Assured." Type "A" transactions are made when load is merely shifted between two operating units or sources and can be rescheduled or cancelled at a moment's notice. Pricing for this type of energy does not usually include "bring on" costs as machines are operated regardless of the economy sale. Buyer must carry additional spinning reserve in the amount of the economy purchase or have an alternate source immediately available.

"Assured" economy transactions, type "B," are those in which buyer and seller agree in advance what the duration of the schedule will be, length of notice period needed to alter the schedule, and the incremental and decremental costs. Buyer's decrement includes banking and startup costs saved by keeping boilers and units off. To lessen the risk of the seller, the buyer agrees to rescheduling in the event that the seller is forced to buy emergency energy; the schedule is then split 50 percent economy rate and 50 percent emergency rate.

The smallest hourly rate in economy transactions is five mw. To provide a margin of safety in costs for such factors as errors in load forecasting, slight changes in fuel quality, etc., there must be a minimum of 0.4-mill spread between increment and decrement before a transaction is made. The greatest

3—Diagram of loop accounting areas; Iowa Power and Light Company serves as loop accountant for the Iowa Pool (within dotted lines) l for utilities in Group "G" (within solid-lined rectangle).



LOOP ACCOUNTING SHEET

IOWA SOUTHERN UTILITIES COMPANY

Date _____ 19____

NET REGULATION

Received | Delivered

Time	Gross Metered Rec'd: IPL 29	II 28	IELP 27	Gross Sched. Del'd To: IPL 80	II 76	IELP 78	IPS 96	A Sum of Debits	A Off Peak	B On Peak	B Off Peak	A On Peak	B Sum of Credits	Gross Sched. Rec'd From: IPL 79	II 76	IELP 77	IPS 99	Gross Metered Del'd: IPL 30	II 26	IELP 25	Time
1 AM																					1 AM
2																					2
3																					3
4																					4
5																					5
6																					6
7																					7
8																					8
9																					9
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4																					4
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6																					6
7																					7
8																					8
9																					9
10																					10
11																					11
12 MN																					12 MN
Total																					Total

Net This Date

Net Previous Accum.

Net Accum. To Date

On Peak—Hours Ending (CST) 7 A. M. - 10 P. M. Except Sundays and Holidays (New Year's, Memorial Day, July 4, Labor Day, Thanksgiving and Christmas).

Off Peak—All Hours Not Covered Above.

Fig. 4—Form used for daily accounting has spaces for recording hourly transactions with each company.

CR TO ALL STATIONS 1232
ECONOMY COST SURVEY FOR 2/16/60

		INC					DEC				
		0-10	10-20	20-30	30-40	40-50	0-10	10-20	20-30	30-40	40-50
	IELP										
	AM	4.9					4.6	4.2			
A	PM	4.4					4.2				
	EVE	5.2					4.8	4.6			
	Other Power Available at Varying Cost Depending on Length of Schedule WDB GA										
	IIGE										
	AM	NA					4.3				
B	PM	NA					4.3				
	EVE	NA					4.3				
	EAB GA										
	IPL										
	AM	3.5	3.7	4.5	4.5		3.5	3.5	3.4	3.3	3.2
C	PM	3.5	3.5	3.7	4.5	4.5	3.5	3.4	3.3	3.2	3.2
	EVE	3.7	4.5				3.5	3.5	3.5	3.4	3.3
	JEL GA										
	IPS										
	AM	4.4	5.5	7.3	9.8		4.4	4.0	3.8	3.7	3.7
D	PM	4.4	4.4	5.5	7.3	9.8	3.8	3.7	3.7	3.7	3.3
	EVE	4.4	5.5	7.3	9.8		4.4	4.0	3.8	3.7	3.7
	These Costs Are Based on Gas in SC and Will Be Higher If We Are Not Released RLM GA										
	ISU										
	AM	6.0	6.2				6.0	5.3	3.1		
E	PM	6.0	6.0	7.7			6.0	3.9	3.0		
	EVE	6.0	6.1				6.0	5.0	3.0		
	LL GA										

Fig. 5—Typical daily economy cost survey gives incremental-cost quotations of each company for as many 10-mw blocks of energy each has in available capacity above its load, and decremental cost quotations for as many 10-mw blocks as tie-line capacity and other conditions will permit scheduling in.

	GEN CAP 1	SCHED PURCH 2	SCHED SALE 3	PEAK PREPARED FOR 4=1+2—3	NATIVE LOAD FORECAST 5	SPIN RESV 6—4—5	INCREMENT FOR ADD'L 10 MW SALE 7	DECREMENT FOR ADD'L 10 MW PURCH 8
	DAV TO ALL 1539 2-15-60 PPFS FOR 2-16-60							
	IELP							
AM	275	2	8	269	245	24	4.9	4.6
PM	255	2	8	249	222	27	4.4	4.2
EVE	283	2	8	277	255	22	5.2	4.8
	IIGE							
AM	197	79	0	276	235	41	NA	4.3
PM	197	79	0	276	228	48	NA	4.3
EVE	201	79	0	280	215	65	NA	4.1
	IPL							
AM	270	0	35	235	225	10	4.5	3.7
PM	270	0	25	245	215	30	3.5	3.5
EVE	270	10	25	255	240	15	....	4.5
	IPS							
AM	184	20	9	195	175	20	5.5	4.4
PM	184	10	9	185	155	30	4.4	4.0
EVE	196	10	9	197	175	22	5.8	5.5
	ISU							
AM	68	13	4	77	72	5	6.0	3.3
PM	68	13	4	77	69	8	6.0	3.3
EVE	68	13	4	77	72	5	6.0	3.3

Fig. 6—"Peak Prepared For" survey shows daily how effectively scheduling has been done to keep off high-cost units and to keep spinning reserve to a minimum.

factor determining how much economy energy is interchanged is the type of fuel available. Maximum scheduling occurs when units which normally use gas are forced to convert to oil in cold weather.

Equalization Energy, the third type available in the pool, is energy which may be requested by a participating company to supply a portion of its load either during normal operations or when its generating or transmission facilities are out of service for scheduled maintenance with the approval of the Administration Committee. The amount of equalization energy that a company may schedule hourly is equal to its accredited demand minus the difference between its accredited generating capacity and its out-of-service capacity.

To illustrate the method of computing a participant's entitlement of equalization energy, assume that Company A has an accredited demand of 250 mw, an accredited capacity of 225 mw, and has a 40-mw generator off for scheduled maintenance. His entitlement would be 250 − 225 + 40, or 65 mw per hour.

Equalization energy is scheduled 12 hours in advance and the rate is five mills.

Conclusion

Carefully worked out procedures plus almost instant communications have provided pool benefits to the Iowa companies without the expense of a central dispatching organization. Each independent member company now enjoys adequate reserve generating capacity with less aggregate installed capacity, ability to meet emergency conditions with less likelihood of service impairment, greater utilization of more efficient capacity, and addition of new generating facilities on a more economical basis as to unit size, location, and timing.

Each dispatcher feels that it is his responsibility to supply his customers' demands at least cost to his company. If he has energy available at a high decremental cost or a low incremental cost, he will not have done his job until he has informed the other four companies. If he can find someone who can do business with him and they can each make a minimum of one dollar, they set up a schedule for the next hour.

The story of Southern California Edison's newly-assigned desert region is told in this picture of a "house" once owned by Wyatt Earp at Earp, California; typical of other shanties that dot the desert. Electric service entrance (right) forecasts growth and prosperity expected here with ample electric power available.

COLORFUL PAST MARKS EDISON'S NEWLY-ASSIGNED DESERT TERRITORY

Recently assigned a 5000-sq-mi desert region of forbidding nature, Southern California Edison evidences faith in its future recreational and industrial potential by investing close to $500,000 in extension of power facilities to serve this new area.

WHEN will they want air conditioning in the Devil's Playground? Or, what's the future of the Whiskey Springs? What load growth can be expected in the Old Woman Mountains?

Oddly enough, these are reasonable questions about real places, and Southern California Edison Company is considering this information about an area assigned to it last year by the California Public Utilities Commission—5000 square miles of Southern California's formidable desert region.

This same desert area once trapped pathfinders and pioneers, and the blazing heat and arid land reduced their horses, oxen—and themselves—to what are now pictured as colorful remnants of bone in the desert landscape. Even now maps of this desert region warn motorists not to leave the major highways without special equipment and ample water; but modern technology is changing the desert's liabilities into assets, and there are many indications that Southern Californians will be spilling over the mountains into the desert to make it a booming recreation, agricultural and industrial area.

Edison's new territory extends roughly from below Parker Dam on the Colorado River north across U. S. Highway 66 to the Nevada border just below Highway 91 which connects Las Vegas and Southern California. From this boundary, the territory extends between 60 and 70 miles westward

into the desert. It excluded the area in and around the riverside rail center of Needles, Calif., which is served by California Pacific Utilities Company.

Recreation Starting To Boom

Evidence of things to come can now be seen on the shores of Havasu Lake, the reservoir formed by Parker Dam's stemming the flow of the Colorado River (approximately 50 miles long and up to five miles wide). Fishing here is considered excellent (catfish 40-50 pounds; 2-3 pound bass), the surface is generally calm and ideal for water skiing (12,000 campers there last Labor Day weekend) and the climate is superb many months of the year.

As a result, the lake shore is already dotted with landings, homes, trailer parks, camp grounds and equipment rentals. These include Havasu Landing, which offers motel and trailer accommodations, camp sites, boats and motors; Roads End, which has an airstrip, and across the lake where the McCulloch Corporation has acquired a peninsula known as Site Six which will be extensively developed with a hotel, restaurant, trailer park, boat landing and two 6000-ft airstrips.

Ore shafts with colorful names such as the Gold Fleece Mine and the Tin Cup Mine are common throughout Edison's new territory, but cement, thought not as romantic, may become a bigger industry here. There are, of course, innumerable homesteader and prospector shanties. Since this is "high desert," ranging from 2000-ft to 3000-ft altitude, the heat and dryness are in the comfort range most of the year. Thus, there are subdivisions in this former "wasteland." One is underway for the Lanfair Valley which offers homesites for weekend retreats and retired folks.

The desert is not now entirely barren and there is good reason to say that in the future the sidewinders will share the land with airconditioned recreation and industrial buildings and homes. Water is available from the Colorado River and other sources, so it is probable that this desert can be made to "bloom" as has been done in California's rich Coachella and Imperial valleys.

Southern California Edison crews span colorful desert landscape with 66-kv line from Havasu substation to company's substation at Gene Pumping Station of Metropolitan Water District.

Edison's substation at the Gene Pumping Station is one of a series of transmission and distribution facilities installed by the Company to serve existing customers and encourage growth of its newly-assigned desert territory.

Power Services Being Extended

Southern California Edison, commensurate with its area development policies, already is encouraging the growth of this area. Approximately $500,000 is being spent for substations and transmission and distribution lines to extend service into the area.

In the latter part of 1959, approximately 13 miles of 16-kv line were installed along the west bank of the Colorado from the Metropolitan Water District's Gene Pumping Station (MWD is the builder of the aqueduct from Hoover Dam to Los Angeles and other areas of Southern California) to Needles Landing on Havasu Lake, primarily to serve the recreation facilities there. One substation is located at Gene Pumping Station and another, Havasu Substation, has been constructed approximately seven miles to the north. These are connected by a 66-kv transmission line. The McCulloch Corporation has extended a 17-kv submarine cable beneath Havasu Lake to connect with Edison lines for the Site Six development.

Still another substation has been constructed at Cima (approximately 70 miles southwest of Hoover Dam). An all-wood 220/66/16-kv substation, it serves Pacific Telephone and Telegraph's microwave stations on Cima Peak, seven miles distant, and on Kelso Peak, 18 miles away, and the towns in the area such as Cima and Kelso.

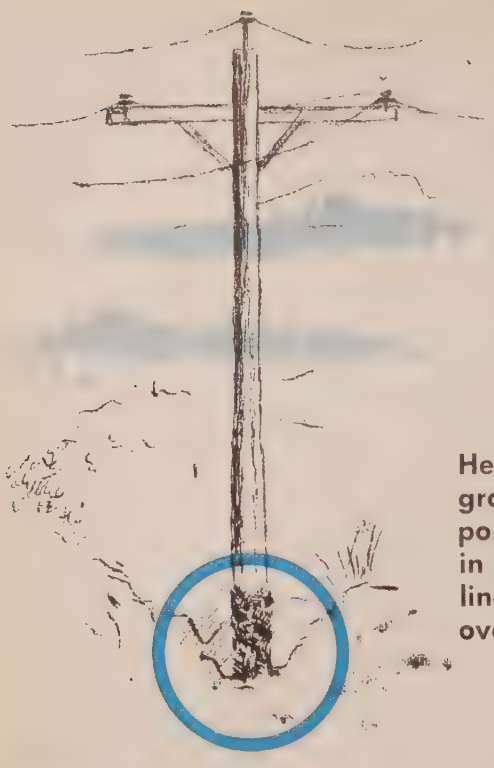
A 40-mile, 16-kv line extends from Camino Substation, which connects to a MWD 200-kv transmission line for energy. This substation serves communities in the area, such as Essex, Danby and Chambless. Another microwave station at Danby is served, as well.

One result of this activity is a change in the desert's skyline. Once dominated by giant Saguaro cacti, which sometimes reach as high as 50 feet, it is now being supplemented with the "trees" of Edison's electric network, an addition welcomed by desert dwellers as a sign of a comfortable, prosperous, future.

So, it's more and more apparent that Southern California Edison might well one day be providing service to airconditioners in that desert area named the Devil's Playground.

Havasu Substation takes power from Gene Pumping Station to serve resorts springing up on shore of Havasu Lake, the reservoir created by Parker Dam on the Colorado River.

The McCulloch Corporation now is constructing a million-dollar resort on the shore of Havasu Lake on which Southern California Edison's new territory borders. This artist's rendering of the McCulloch development shows hotel, restaurant, trailer park and other facilities being built.



WHEN TO TREAT SOUTHERN PINE POLES

Here's when and why it is desirable to establish a program for ground-line treatment of standing pressure-treated southern pine poles. Where a utility has 100,000 of these poles that have been in service for 15 years or more, the potential savings of ground line treatment over replacements amounts to about $500,000 over a 20-year period.

By WAYNE H. JOHNSON
Head, Distribution Engineering Section,
American Electric Power Service Corp.

EACH company should establish its own treatment program by making a suitable inspection of poles so that failure rates can be determined for its operating area. Records are a very important part of an adequate maintenance program, and those that apply to one area will not necessarily serve as a basis for a program in other areas.

Actually, the problem of ground-line treatment of southern pine poles is one that may not be readily solved until experience with several types of ground-line treatment is recorded and analyzed. While much has already been accomplished in the way of developing various types of treatment, there is no assurance that any of these treatments meets all of the desired ends. The southern pine pole has sapwood thicknesses of 2 to 4 in., and any ground-line treatment that is applied may not provide sufficient support because it may not completely penetrate all of the sapwood. For example, some of the experiments now being conducted on various types of ground-line treatment indicate that only the outer ½ to ¾ in. of the sapwood receives enough additional preservative material to prevent decay.

Editor's Note: This is an abstract of a paper presented by the author at the EEI Transmission and Distribution Committee meeting, January 1960.

Inspection Is Prerequisite

Because of varying soil, weather, and wood, the first step in establishing a program for ground-line treatment of southern pine poles is to determine by careful inspection the condition of existing poles. This is required in order to determine when it is necessary or economical to start a ground-line treating program.

During the past two or three years several thousand 8-lb fully-treated pine poles were inspected in various areas around the AEP System. These inspections extended from 18 in. below the ground to the pole top. The results were as follows:

Location	Number of Poles	Total Poles Rejected
Huntington, W. Va.	4,121	3.45%
Ohio, various points	556	0.5 %
Wheeling, W. Va.	937	2.9 %
Kingsport, Tenn.	2,818	7.6 %

Note how varying locations show different rates of rejection for approximately the same age groups of poles, all 15 to 30 years old. Some of these poles were ground-line treated after inspection, before closing the excavation. Although this was not done in all cases, good practice suggests doing something to replace the toxic material removed from the ground-line area during excavation for inspection. Cost of applying such a preventative after excavation at the ground line for inspection is minor compared with the cost of making the excavation and inspection. One of the largest groups inspected includes 4121 eight-lb creosoted poles in the Huntington, West Virginia,

(Continued on page 79)

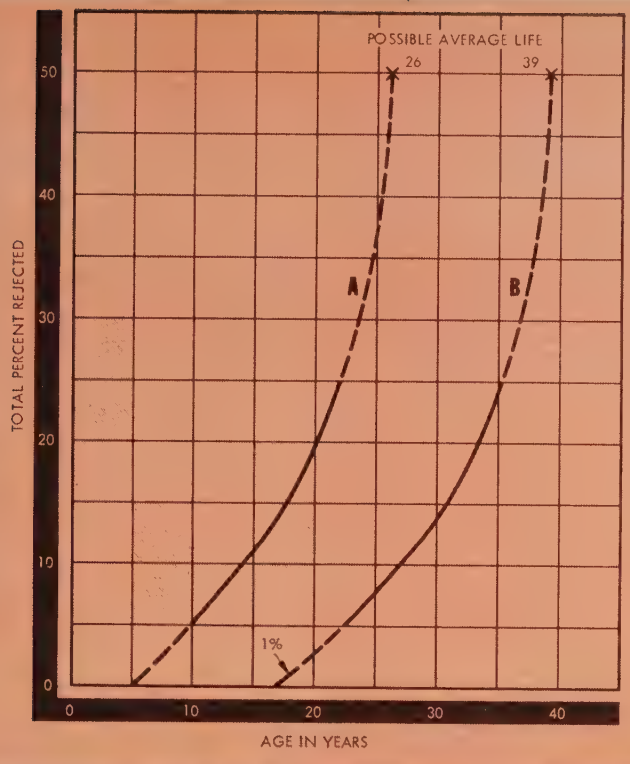


Fig. 1—Rejection rates vary with age of poles and should be determined locally for each area. The probable range is shown between curves A and B. Ground-line treatment should begin far enough in advance of the one percent rejection rate to avoid pole replacements.

COMPARISON BASED ON PRESENT WORTH OF ANNUAL COSTS

(FOR 1000 POLES)

POLE REPLACEMENT PROGRAM							COMMON FACTORS		POLE-TREATING PROGRAM	
A Poles Rejected	B Capital Investment A x .75 x $70	C Cumulative Net Capital Addition	D Fixed Charges C x 15%	E Non-Recurring Costs A(.75 x $40 + .25 x $50)	F Total Annual Costs D + E	G PW of Total Annual Costs F (PW)	Year	PW Factor	Total Annual Costs	PW of Annual Costs
10	$ 525.00	$ 525.00	$ 78.80	$ 425.00	$ 503.80	$ 474	18	.94	$ 6,500	$ 6,100
7	367.50	892.50	134.00	297.50	431.50	384	19	.89		
8	420.00	1,312.50	199.00	340.00	539.00	452	20	.84		
7	367.50	1,380.00	207.00	297.50	504.50	423	21	.84		
8	420.00	1,800.00	270.00	340.00	610.00	482	22	.79		
8	420.00	2,220.00	330.00	340.00	670.00	502	23	.75		
8	420.00	2,640.00	396.00	340.00	736.00	515	24	.70		
10	525.00	3,165.00	475.00	425.00	900.00	602	25	.67	6,500	4,090
15	787.50	3,952.50	593.00	637.50	1,230.50	726	26	.59		
17	892.00	4,844.50	725.00	722.50	1,447.50	810	27	.56		
15	787.50	5,632.00	835.00	637.50	1,472.50	780	28	.53		
18	945.00	6,577.00	987.00	765.00	1,752.00	876	29	.50		
10	525.00	7,102.00	1,065.00	425.00	1,490.00	700	30	.47		
15	787.50	7,889.50	1,163.00	637.50	1,800.50	792	31	.44		
23	1,207.50	9,097.00	1,362.00	977.50	2,339.50	982	32	.42	6,500	2,730
17	892.00	10,989.00	1,650.00	722.50	2,372.50	925	33	.39		
22	1,155.00	12,144.00	1,821.00	935.00	2,756.00	935	34	.37		
23	1,207.50	13,351.50	2,003.00	977.50	2,980.50	1,073	35	.35		
35	1,837.50	15,188.50	2,780.00	1,487.50	3,767.50	1,245	36	.33		
50	2,625.00	17,813.00	2,675.00	2,125.00	4,800.00	1,490	37	.31		
55	2,887.50	19,700.00	2,958.00	2,337.50	5,295.50	1,535	38	.29		
119	6,247.00	25,947.00	3,890.00	5,057.50	8,947.50	2,530	39	.28	6,500	1,820
500					$47,346.80	$19,233			$26,000	$14,740

. 2—Cost analysis shows how a ground-line treating program pays off when compared to the higher cost of replacing poles. Pole-treating cost of .50 per pole applies to all 1000 poles and includes $5 for contractor plus $1.50 for our inspection and record work. Pole-replacement costs are allo-ed on the basis of 75 percent actual replacement and 25 percent stubbing. In setting up the table, these ratios were applied to a $70 cost for talling the average distribution pole, a $40 non-recurring transfer charge (which includes pole-removal cost, less salvage value) for changing each le, and a $50 maintenance cost for stubbing a pole. Poles rejected are conservative, based on Mortality Curve B.

Development of distribution transformer bushing terminals to accommodate either aluminum or copper conductors has necessitated a special design and test approach.

SPECIAL DESIGN CHARACTERIZES TERMINALS for Distribution Transformers

By TRUMAN B. SHAW,
Senior Engineer
Anderson Electric Corporation

USE OF all-aluminum and ACSR conductors in distribution applications and the resulting need of transformer terminals that are suitable for aluminum, as well as copper, conductors has led to new performance requirements of the distribution transformer bushing terminal. This is recognized, and is being investigated, by most connector manufacturers, utilities and transformer manufacturers.

Some interesting approaches to these new requirements have been taken by connector manufacturers. [1][2] Most of these have been tempered by commercial aspects of the problem, and to an extent, this is very necessary. It is our purpose here to establish a clear understanding of the requirements of a universal terminal and to present our recommendations for meeting these requirements based upon the results of many tests performed in our laboratories. It should be noted that these recommendations can be applied to any bolted connector that is required to accommodate either aluminum or copper conductors.

The aluminum conductor introduces new requirements that were of less significance with the sole use of copper conductors. It is desirable that the universal terminal meet these requirements without detracting from any of the performance and economic standards that are held by present terminals for copper conductors only.

Although it is not within the scope of this article to explore all phases of terminal design, a review of the more basic new requirements would reveal the following:

1. Adequate contact pressure after assembly and possible initial conductor cold flow.
2. Adequate contact pressure after heat cycling and possible further conductor cold flow.
3. Low resistance joint in the presence of the characteristic high resistance aluminum oxide film.
4. Freedom from damaging galvanic corrosion.

Design Approaches Explored

Various design approaches for meeting the new requirements could be taken. It would be well, at this point, to explore various approaches and evaluate the performance advantages of each. These approaches will be concerned primarily with the termination of the aluminum distribution conductors. The internal transformer lead connections require special attention and are best accomplished by tailoring the terminal to the individual

transformer manufacturer's requirements.

A listing of the previously-established performance requirements and design approaches to meet these requirements are as follows:

Requirement No. 1—Adequate contact pressure after assembly and possible initial conductor cold flow.

Tests on aluminum conductors in various types of bolted connectors have shown that initial cold flow can be very severe. This is especially true on high-pressure connectors such as eyebolt-type terminals. Refer to Fig. 1 for data showing the cold flow and load loss, over a period of 24 hours, on No. 2, 7-strand aluminum conductor assembled in a typical plated bronze eyebolt-type bushing terminal. Fig. 2 shows the test arrangement for obtaining this data.

It would appear, upon first consideration, that the best approach to this problem would be to design a terminal that will not produce cold flow in the conductor. Theoretically, if the unit pressure upon the conductor is sufficiently low, no cold flow will result. However, it must be remembered that the aluminum-oxide film on the conductor strands must be broken in order to achieve a low-resistance joint. A low unit pressure will not accomplish this as efficiently as a high unit pressure. There are at least two other reasons that make this approach erroneous and impractical. One is that, in order to produce a low unit pressure, the long contact length would make the size and cost of the terminal too great. The other, and most conclusive, reason is that the elimination of initial cold flow does not guarantee a sound electrical joint when heat cycled. A further discussion of this problem will follow under our second requirement—adequate contact pressure after heat cycling and possible further conductor cold flow.

The remaining approach to this requirement is to provide a compensating mechanism that will maintain adequate contact pressure after initial cold flow. This mechanism can be any one of the following, providing that materials may be selected to meet the necessary mechanical and economic requirements: (a) coil springs, (b) leaf springs, (c) dished spring washers, or (d) internal spring action built into a clamping member. Anderson Electric has designed terminals using dished spring washers that have maintained adequate contact pressure, after initial cold flow, for aluminum and ACSR conductors ranging from No. 6 solid aluminum through 1590-mcm ACSR.

Requirement No. 2—Adequate contact pressure after heat cycling and possible further conductor cold flow.

Refer to Fig. 3 for data showing the cold flow and resultant assembly torque loss for a typical plated bronze bushing terminal assembled with various sizes of aluminum conductor and oven heat-cycled. Our objective in this test was to establish the relative cold flow characteristics of various sizes of aluminum conductors under iden-

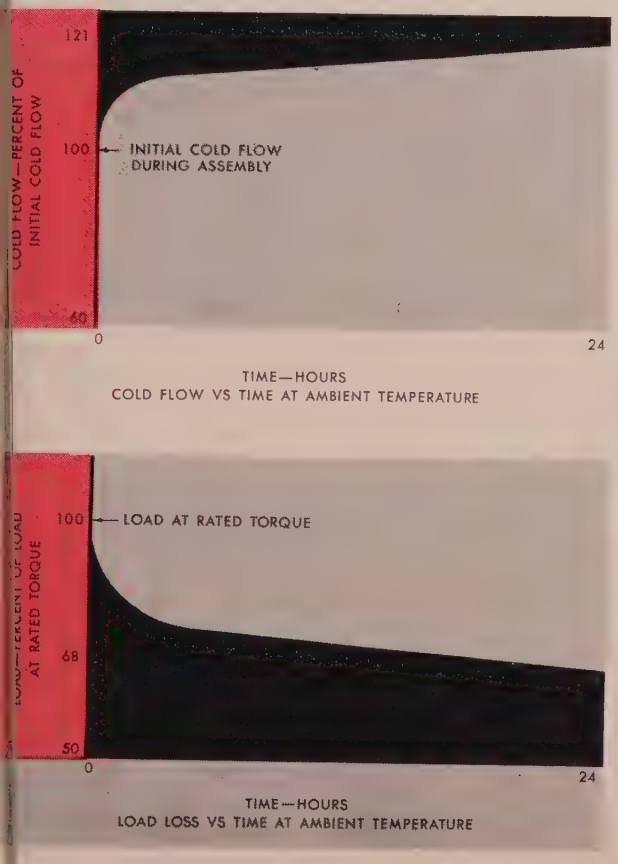


Fig. 1—Chart of cold flow and load loss, over a period of 24 hours, on a No. 2-7 strand aluminum conductor assembled in a typical plated bronze eyebolt-type bushing terminal.

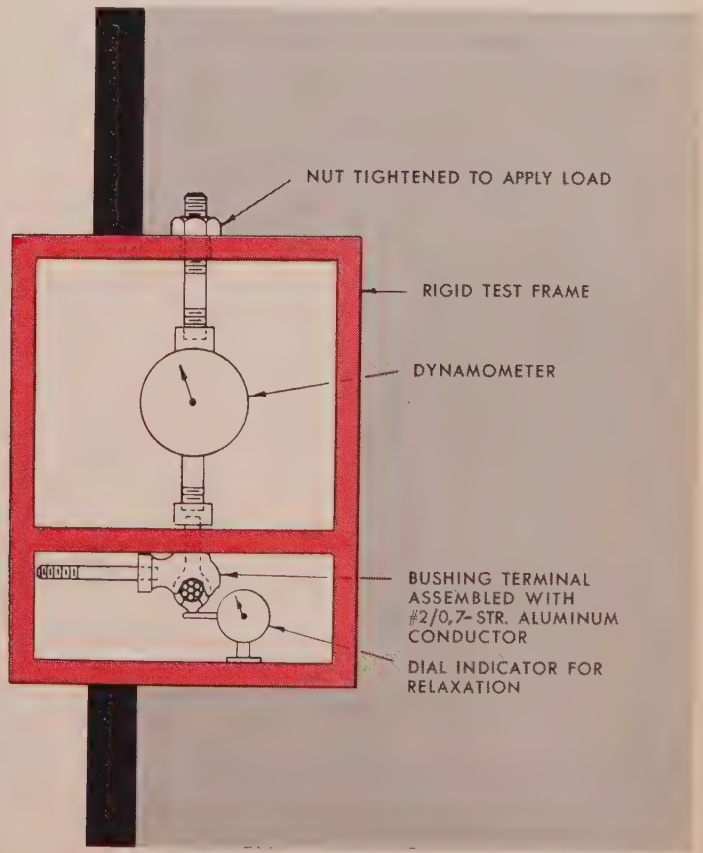


Fig. 2—Test arrangement for obtaining data given in Fig. 1.

tical heat-cycling conditions. Since the cycling method differs from current standard methods, the resultant data should be utilized for comparative purposes only, rather than relating the performance of any one conductor to field performance. It was found that, on all conductor sizes, equilibrium was reached after the fourth heating cycle. Each cycle consisted of raising the terminal and conductor assemblies to 125C and then letting them cool to an ambient temperature of approximately 30C. This test shows that the maximum aluminum conductor has twice as much cold flow as the minimum aluminum conductor for the conductor range tested.

Before attempting to arrive at design approaches for this requirement, it is necessary to understand the factors causing cold flow in heat cycling. If it were possible to design a terminal meeting all requirements using materials with the same thermal expansion characteristics as the conductor being clamped, there would not be any cold flow of the conductor and resulting relaxation within the clamping assembly due to thermal cycling. Of course, it is not possible to design such a terminal for both aluminum and copper conductors because of the wide difference in the expansion characteristics of the two metals.

Most transformer terminals are fabricated from copper or copper-base alloys. These materials have been very satisfactory in meeting strength and electrical requirements. When using copper-base alloys for the terminal components and a plating to prevent galvanic corrosion, the factors influencing aluminum-conductor cold flow can be determined and compensated for. The aluminum conductor has a thermal-expansion rate that is approximately 50% greater than the copper-base alloy terminal. Therefore, it can be seen that, with a temperature rise, the aluminum conductor will attempt to expand in all directions, but will be prevented from full expansion at points of contact. The result will be further flattening and permanent set at these contact points which are quite numerous with stranded conductor. When the terminal returns to the original temperature, certain contact points will be pulled away from their mating contacts and a looser joint will result. Unless this looseness is compensated for, on the next load cycle the joint will have a higher resistance. The higher resistance will produce a higher temperature which, in turn, will cause more thermal expansion and more conductor flow. Additional cycles may cause complete failure of the joint.

From the foregoing, it is obvious that the most practical and objective approach to Requirement No. 2, when using copper-base alloy terminals, is the use of a compensating mechanism such as was discussed for Requirement No. 1. Long contact grooves will not prevent loose joints caused by heat cycling. Tests at Anderson Electric have established optimum conductor groove lengths for use with dished spring washers. It has been shown that, beyond a certain length, no additional length will produce a greater difference between conductor and terminal operating temperature in electrical heat cycling. Refer to Fig. 4 for test data showing the electrical heat cycling characteristics of various groove lengths applied to bushing terminals that are identical otherwise.

Electrical heat cycling tests of plated bronze eyebolt-type universal terminals for conductors ranging from No. 6 solid aluminum through 1590-mcm ACSR have been conducted at Anderson Electric and it has been clearly established that the eyebolt terminal, when provided with a dished spring washer, performs very satisfactorily.

The foregoing discussion and recommendations have been concerned with the use of aluminum conductors in copper-based alloy terminals. We have shown that the difference in thermal expansion rates and resultant high contact pressures in heat cycling can cause sufficient deformation of the aluminum conductor to cause ultimate failure of the electrical joint when no compensating mechanisms are present.

It is now in order to determine the performance that can be expected, under heat cycling, of an aluminum terminal assembled with an aluminum conductor and without means for compensation of relaxation. In general, it can be stated that a terminal with all-aluminum components will provide better performance than the same type of

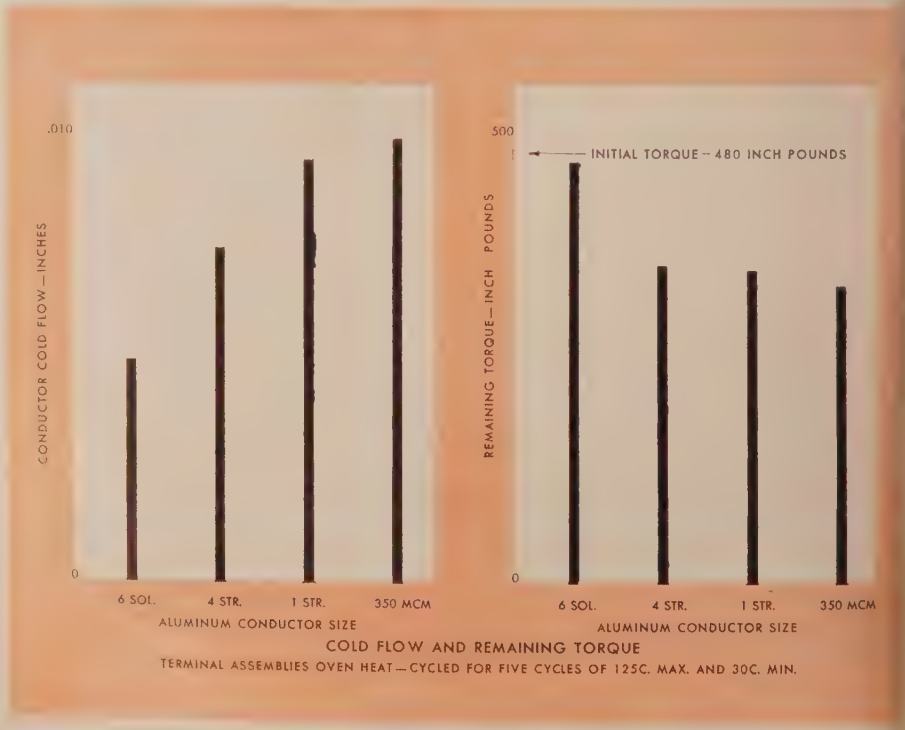


Fig. 3—Cold flow and resultant assembly torque-loss data for a typical plated bronze bushing terminal assembled with various sizes of aluminum conductor and oven heat-cycled.

terminal with components of dissimilar materials. An all-aluminum terminal, properly designed, should pass severe heat cycling tests when assembled with an aluminum conductor. This is because the terminal components and conductor will expand and contract at equal rates and, thereby, will have less tendency to build up excessive deforming pressures at contact points. The tendency of this assembly to loosen excessively due to temperature change will also be overcome. Certain design considerations may dictate the use of other materials, in addition to the basic aluminum members, to complete the terminal assembly. An important factor here is to use materials that are of wide variance from the aluminum thermal-expansion rate, in the shortest possible effective length in the clamping assembly. This will insure the smallest possible detrimental effect on the terminal and conductor assembly.

As we are concerned, primarily, with universal terminals, we must consider the performance that can be expected of the all-aluminum terminal, in heat cycling, when assembled with a copper conductor. On the heating portion of the cycle, the aluminum clamping members will expand faster than the copper conductor. On some designs, this can cause the conductor groove to pull away from the conductor. Such a condition could ultimately result in failure of the joint.

We feel that it is wise to use a spring-action compensating mechanism, added or built in, on aluminum universal terminals to insure adequate clamping on copper conductors under all cycling conditions. Also, this same mechanism will insure compensation for any relaxation of an aluminum conductor upon initial torquing and fulfill the universal requirement of the terminal.

Requirement No. 3 — Low-resistance joint in the presence of the characteristic high-resistance aluminum-oxide film.

The aluminum-oxide film on aluminum conductors must be broken and an intimate contact between the cable and cable groove must be maintained in order to insure a sound, low-resistance electrical joint. The oxide film may be broken by abraiding the conductor through a suitable grease-type compound, such as Anderson No. 155 Grease. Maintenance of adequate pressure and an airtight contact is important because the aluminum-oxide film will reform immediately in the presence of air. The use of a spring compensating mechanism will insure that adequate pressure is maintained.

Requirement No. 4—Freedom from damaging galvanic corrosion.

Proper materials must be selected for the terminal body and hardware to prevent damaging galvanic corrosion of the less noble material in the presence of an electrolyte such as salt spray or industrial atmospheres. Where copper-base alloys are used, flowed electro-tin plating is used to prevent serious damage to the aluminum conductor. Where aluminum alloys are used, tin-zinc plating is used for prevention of damage to the terminal body when assembled with a copper conductor.

Test data has been compiled showing the superiority of the above platings in salt-spray cabinets, industrial-atmosphere cabinets and actual installations at seashore and industrial sites.

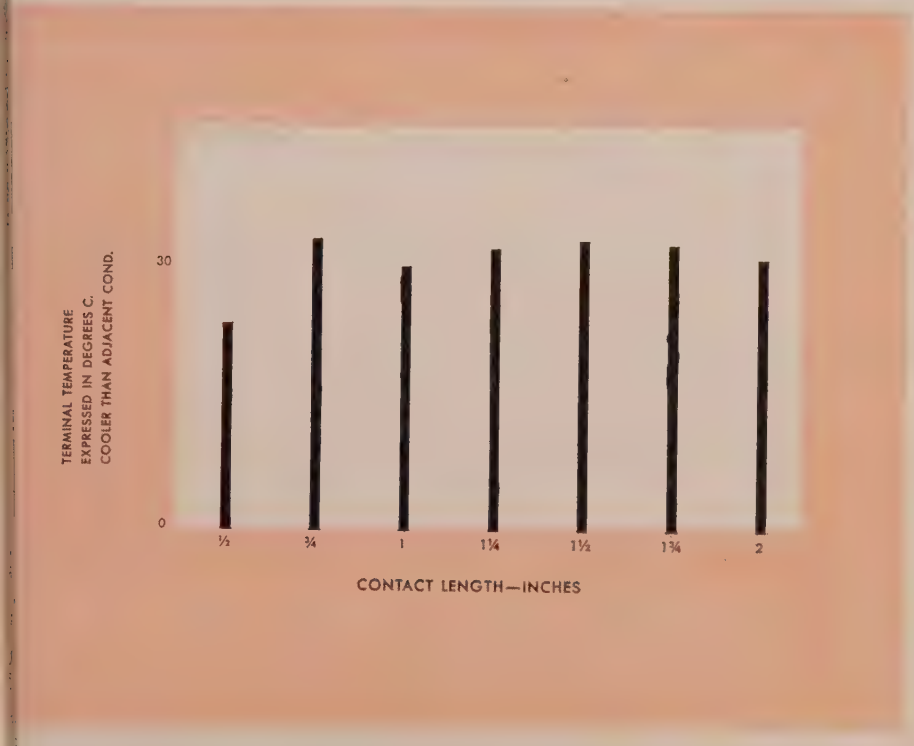


Fig. 4—Chart of terminal temperature vs. conductor groove length.

Summary

A very satisfactory copper alloy, eyebolt-type universal terminal can be designed with the proper selection of materials, plating, conductor groove configurations and compensating mechanisms.

A very satisfactory aluminum alloy terminal can be designed with the proper selection of the aforementioned design factors.

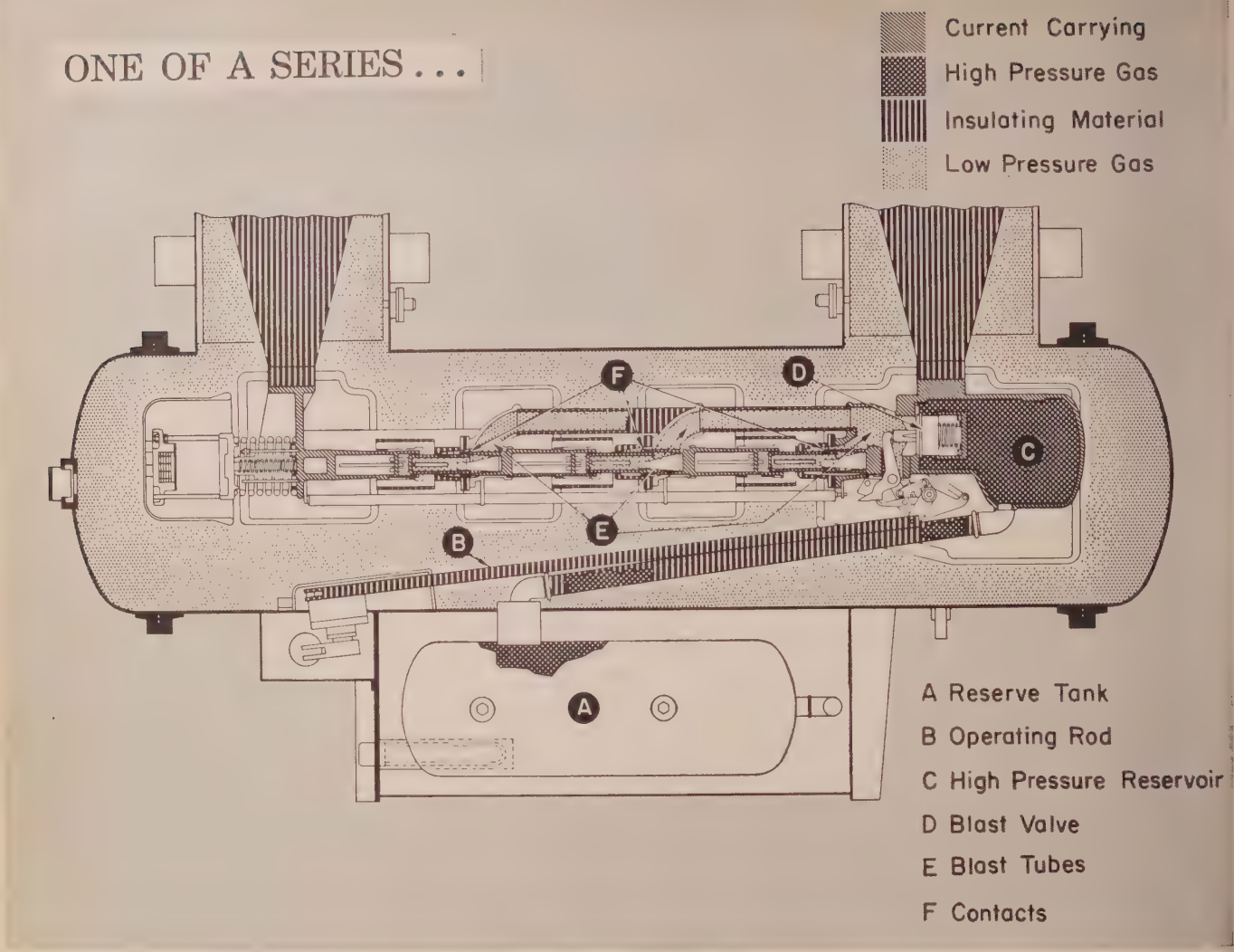
Assurance of a satisfactory universal terminal is not complete until a thorough electrical heat-cycling test program has been conducted on the conductor offering the severest electrical and mechanical conditions for a particular conductor range.

References

(1) AIEE Conference Paper entitled "Universal Connectors for Distribution Transformers" by Morris Brenner of Penn-Union Electric Corporation.

(2) Trade paper entitled "New Copper Alloy Has High Stress-Corrosion Resistance" by C. H. Hannon of General Electric Company, printed in Nov. 1952 issue of "Iron Age."

ONE OF A SERIES . . .



A uniform 45-psig pressure is maintained in the gas-filled pole units. Contacts in all interrupters are *opened* simultaneously by a spring accelerator. They are closed by a pneumatic mechanism, proved in years of oil breaker service.

Initial movement of the contacts opens a blast valve in the high-pressure reservoir within the pole unit, at right. SF_6 gas is directed from the high-pressure reservoir to the interrupting orifices at 220 psig to snuff out the arc.

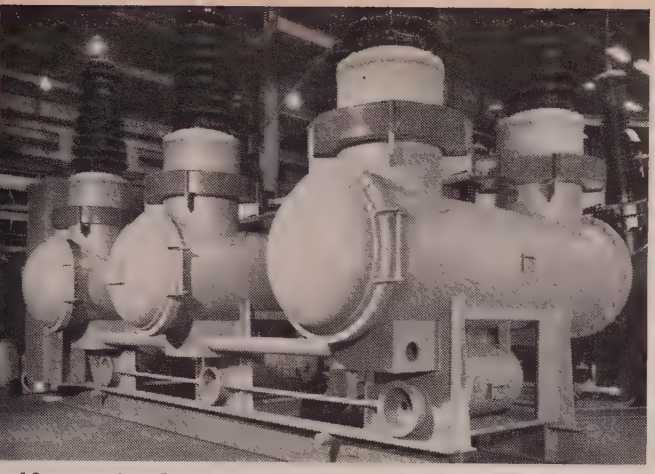
Design of new type SF_6 Gas Breaker extends operating life, slashes maintenance, reduces installation cost

Provides improved performance from 69 to 460 kv and beyond

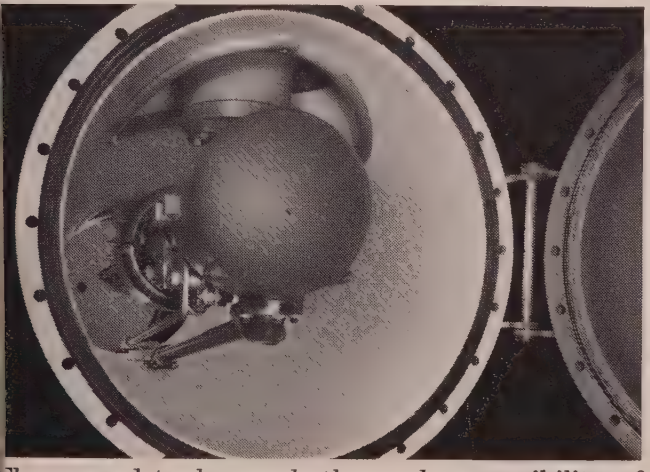
The most advanced power circuit breaker in industry today is made possible by the unique properties of the SF_6 gas interrupting medium. Remarkable dielectric strength, high recovery rate and long life of the gas, coupled with the minimum arc erosion of interrupter contacts, give the Westinghouse breaker greatly increased service life. Periods between routine inspections are *at least* twice as long as for other breakers.

Advantages of the breaker's compactness are easy to see at installation time. Ratings up to 230 kv can be shipped fully assembled to most locations on the unitized base, ready for mounting on a concrete pad. Breaker weights have been cut to *less than* ½ those of comparable oil breakers in many ratings.

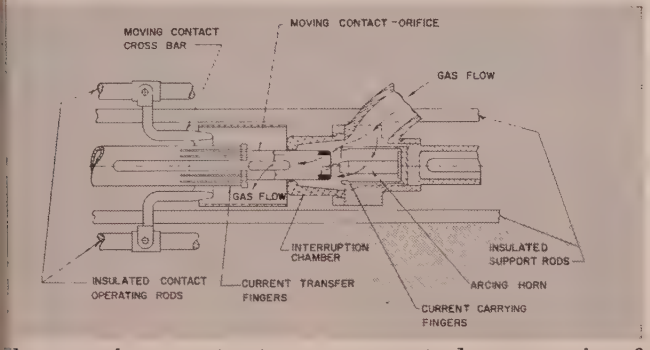
The SF_6 gas system under 45 psig is completely



self-contained to conserve the gas and provide quiet operation. High-pressure reservoirs at the end of each unique horizontal interrupter supply SF_6 gas at 220 psig to the individual interrupting chambers. Reserve capacity is assured by individual high-pressure tanks beneath each pole unit. Capacity is sufficient for four operations without pump operation. The breaker operating levers to the three poles are mechanically linked to provide synchronization of all contacts.

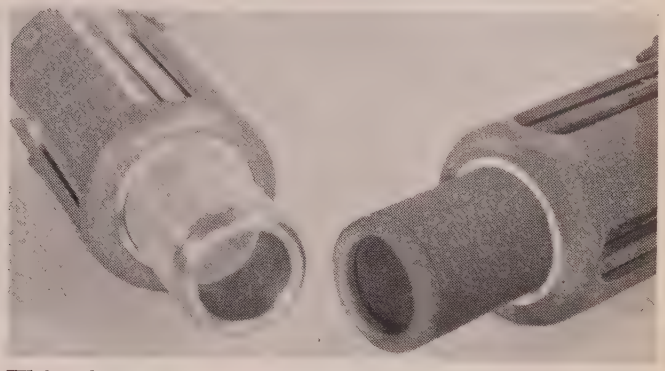


The opened tank reveals the ready accessibility of the entire interrupter. Unique insulating properties of SF_6 permit this compact design with minimum live-part to tank clearances. Bottom pipe feeds high-pressure gas to blast reservoir. Smaller rod operates breaker contacts.



The moving contacts are mounted on a pair of parallel insulating pull rods for simultaneous operation. Contact fingers of both the moving and stationary contacts are silvered cupaloy for maximum conductivity. An arcing horn inside the stationary contact absorbs the brunt of arc action. The hollow moving contact, designed to minimize arc erosion, is also faced with special arc-resistant material.

Actual interruption is contained within a teflon chamber. High-pressure gas blasts the arc between the contact surfaces and flows through the hollow moving contact . . . out ports in the side, into a Micarta® shield.



This shot illustrates the effectiveness of the new Westinghouse interrupter design. The contact at right evidences minimum erosion after 45 interruptions of between 24,000 and 45,000 amperes . . . equivalent to over 36 operations at breakers rated 37,500 amperes.

SF_6 gas has unique properties that give it exceptional arc quenching ability. In this demonstration, a high-voltage arc, readily drawn in an air-filled tube, is quickly extinguished by injecting a small amount of SF_6 gas. Sulfur-hexafluoride's electronegativity causes it to absorb free electrons . . . provides an extremely high rate of recovery of dielectric strength. Arc space is converted from a relatively good conductor at current zero to a good insulator in a few millionths of a second.

To learn more about the money-saving features of this product, call your Westinghouse sales engineer or write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-61001

DEVELOPED BY PHELPS DODGE

CUFENLOY-30 ... DRAWN, STRESS-RELIEVED CONDENSER TUBES THAT OFFER IMPROVED PROPERTIES ... CUT BUNDLE COSTS!

Approved under ASME Code for unfired pressure vessels

Cufenloy-30 tubes emerging from annealing furnace after special heat-treating operation

New, high strength Phelps Dodge Cufenloy-30 condenser and heat exchanger tubes are the result of years of intensive Phelps Dodge research devoted to improving the properties of copper base alloys.

Cufenloy-30 (copper-nickel alloy containing nominally 70% copper and 30% nickel) properties offer OEM and re-tubing users these important advantages:

1. Increased tensile and yield strength for up-to-800°F. metal temperature.

2. Thinner tube walls, when substituted for annealed cupro-nickel 30%, that reduce total tube bundle weight as much as 15% with consequent lowering of cost per bundle.

3. Cost reduction up to 50% per bundle without any sacrifice of safety when substituted for the annealed 65/35 nickel-copper alloy.

Cufenloy-30 tubes are fabricated by a special Phelps Dodge-developed drawing and heat-treating process that is unique in the industry. Test data on this improved tube was thoroughly evaluated by an independent research institute and final results submitted to The American Society of Mechanical Engineers. Under case num-

GE and AEP Test For Minimum Reclosure Time For 345-Kv Line

Information derived from the irst impulse testing of an energized 45-kv line is now being sifted by ngineers of American Electric ower and General Electric in opes that it will shed light on the uestion of how long a circuit reaker should wait until it recloses fter interrupting a fault on a high oltage transmission line.

The tests, conducted jointly by he two companies at GE's high oltage switchgear laboratory in hiladelphia, are the first to simu- te actual lightning conditions en- ountered in the field, according to E spokesmen.

In each of the tests, the 18 in- lator string was energized with kv from the lab's power generat- g source. When the 10,000 amp mpulse flashed over the string for veral hundred microseconds, pre- termined currents from the wer source ranging from 5,000 27,000 amps resulted, simulating normal 345-kv power-follow arc. The impulse and power-follow cs result in an ionized gas cloud rrounding the insulator string hich promotes a re-strike if suf- ient dead time is not allowed for e cloud to de-ionize and become n-conductive.

After an air blast power circuit eaker interrupted the power arc, dead time was varied from test to test from 25 cycles down to five. With the closing of a second breaker, a linearly rising voltage from the high-pot transformer capable of cresting in a few microseconds was applied to the string, simulating the system reclosing transient.

This voltage assured breakdown in each test, with the breakdown point being recorded in each case, with interpretation in terms of dead time for a given reclosing transient.

Results of the tests are currently being analyzed by GE and AEP engineers. These will be reported as soon as available.

An intentionally unsuccessful reclosure—as seen from just beneath a simulated 345-kv transmission line. Bright arc flashing from conductor at bottom back into ionized gas cloud surrounding insulator string is restrike occurring as breaker is reclosed several cycles after 3000-kv impulse generator sparked over insulator and after power arc is extinguished. This test was one of over 150 conducted by engineers from GE and American Electric Power. Information was sought concerning arc de-ionization time and its effect on successful reclosure on transmission lines carrying 345 kv and above.

ansformer Moving Costs t by New Design

o eliminate much of the labor ts incurred by a west coast util- in moving transformers from site to another, Moloney Elec- Company developed an ex- mely compact design for this 25 A, 115 KV, LTC transformer. e size of the unit is such that it y be transported between instal- on sites without being disassem-

(Continued on next page)

Transformer Moving . . .

(Continued from page 71)

bled to meet freeway clearances.

In addition to eliminating labor costs involved in assembly and disassembly of the transformer, the task of relocating transformers is greatly expedited. The dimensions of the transformer shown above permitted shipment completely assembled, except for lightning arresters and brackets.

Rocky Reach Information System Utilizes Magnetic Drum Programming

The solid-state information system recently purchased by Public Utility District No. 1 of Chelan County, Washington, for its Rocky Reach Hydroelectric Power Project will be completely programmed by magnetic drum. Designed and manufactured by Bailey Meter Co., it represents the first industrial application of magnetic drum programming to a digital data gathering alarm scanning and logging system.

The system, called Metrotype, will measure and scan continuously 110 variables (current, voltages, power, gate position, etc.), one per second, and log out all points once an hour or on demand. High and low set points may be programmed for any or all variables causing a visual and audible alarm for off-normal conditions.

The system consists of standard Bailey functional modules, thus providing the advantages of magnetic drum programming without special equipment. Future expansion of the system to 170 points will merely require the addition of modules and reprogramming.

According to the manufacturer, program data stored on the drum is not affected by being read out or by power failure. Programming may be changed, however, by writing new data over the old. In this manner point sequence may be altered, or alarm set points may be changed. Stone & Webster engineered the systems.

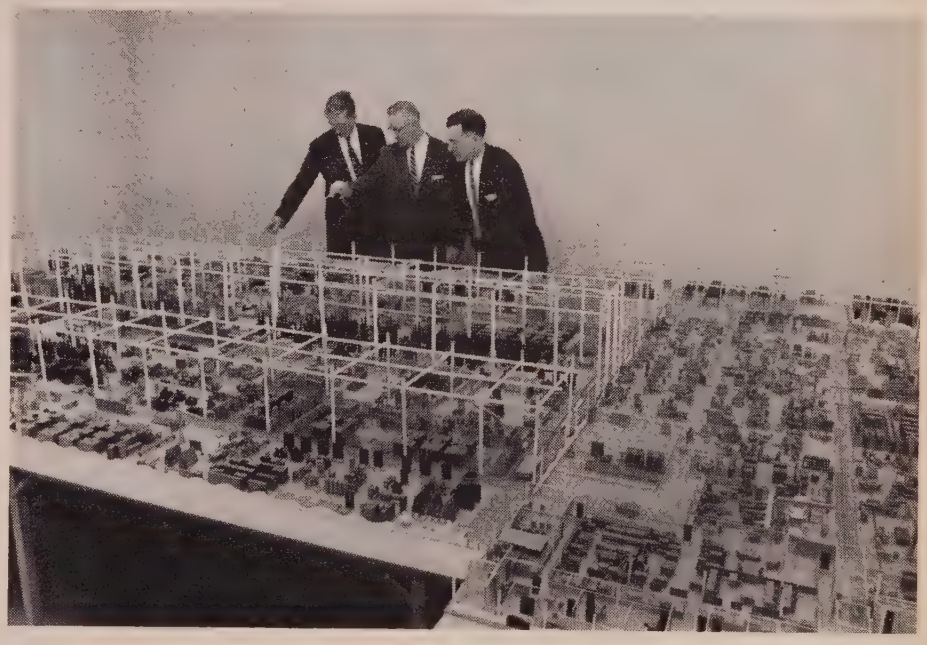
Mobile Transformer Heads West

This two winding mobile transformer, rated 20 MVA, 3-phase, 115,000 kv grounded Y/66.4 kv to 34.5 kv delta. Unit has manual no-load tap changers in the high and low voltage windings and lightning arresters for high and low voltage protection. The transformer was recently shipped to California Electric Power Co. from Allis Chalmers Terre Haute (Ind.) works.

Westinghouse Pioneers In-Line Production of Breakers

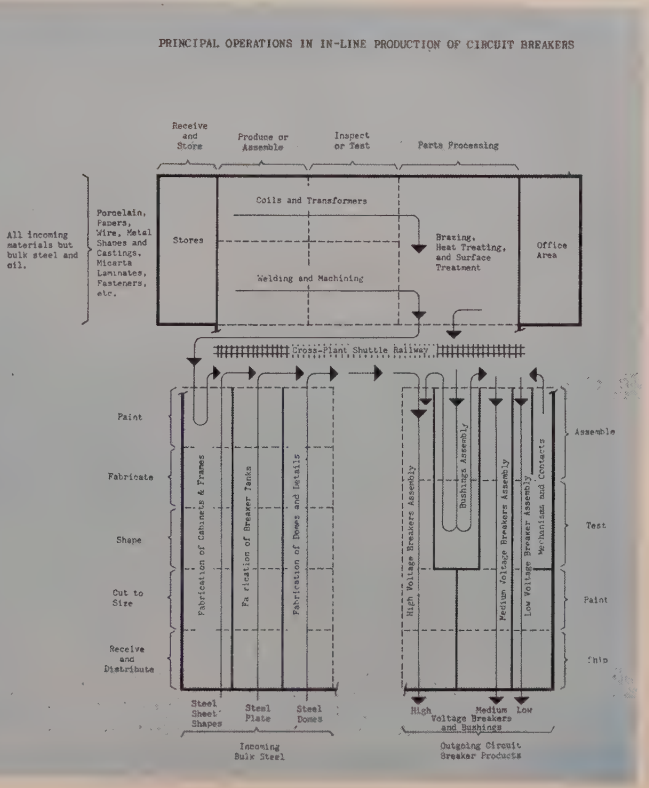
Taking a giant step from job-shop operation toward automation, Westinghouse Electric Corp. has completed a large plant at Trafford, Pa., for in-line production and assembly of circuit breakers. In keeping with this pioneering approach, the entire plant was planned without the use of blueprints or conventional drawings. Instead, three-dimensional layout techniques permitted designers to plan internal flow and storage of materials, and location of machine tools for greatest efficiency.

The improved flow pattern and material handling, combined with the conversion to in-line production result in reduced delivery time on customer orders, shorter manufacturing cycles, substantial reductions in inventory investment, and reductions in costs. Now in operation, the plant occupies 370,000 sq. ft of the floor and frame-mounted types. In addition the plant also produces a number of compressed air breakers primarily for indoor use. Increased future production of sulphur hexafluoride gas (SF-6) circuit breakers is anticipated.



Scale models of all equipment were employed to make a three-dimension layout of the plant, rather than resorting to the more conventional method of design and engineering a plant with drawings and blueprints. Use of the models instead of drawings greatly facilitated modification during planning.

Products of the new plant are primarily oil-filled circuit breakers of



Circuit breakers produced at Westinghouse's new Trafford (Pa.) plant follow a flow pattern roughly similar to the Greek letter *pi*. Bulk steel enters at bottom left and is fabricated into major components along three 550-ft aisles. Machined, welded, and brazed parts are produced in the area across top of diagram. All components merge at top right, and are assembled progressively by in-line techniques in the aisles at right of diagram. Complete breakers emerge from the plant, ready for shipping at lower right.

Trafford was chosen as a location because it is near to East Pittsburgh (six miles) and to the Westinghouse high-power laboratory, an essential facility for testing new circuit breaker designs. A third reason was availability on the site of a serviceable building with 132,000 sq ft of manufacturing space and adequate air, electricity, steam, and water for an additional 239,000 sq ft of plant on adjacent level site.

Need for this new plant became apparent in 1956 from 10-year market forecasts. The surveys indicated that apparatus requirements of the electric utility industry would eventually overtax facilities for circuit breaker production at the Westinghouse East Pittsburgh Division. For detailed planning, 30 committees of industrial and manufacturing engineers were put to work, each on a specific area of the plant. A superintendent of facilities planning integrated and coordinated the committees' plans to eliminate all production problems that had been encountered in the

(Continued on next page)

Westinghouse . . .

(Continued from page 73)

past and to make the fullest possible use of modern production techniques.

Use Punch Card System

At the same time the department's production system was converted to a punched card system in which manufacturing information is computer processed to give manufacturing and inventory control information, machine load data, and production follow sheets. (More recently the production cost system has also been put on punched cards for similar processing.) Consequently, the amount of paper work to handle an order through the manufacturing sections has been much reduced.

Circuit breakers and major components are progressively assembled on multistation lines. In many cases this approach was also followed for testing and parts production. Conveyorized multistation assembly lines were designed to accommodate parts and assemblies of widely differing shapes and sizes. Production machines were selected and placed to provide the greatest possible flexibility. To eliminate manual effort as much as possible, operators were provided with materials handling equipment.

The new plant is designed not only for production, but also as headquarters for the Power Circuit Breaker Department. It will house the administrative, engineering, manufacturing, and sales activities of the department. Marketing activities are administered from the department. In the field, sales activities are carried out by sales engineers of the Westinghouse Apparatus Division, reinforced by a number of product specialists at strategic locations across the country. Purchasing and industrial relations are handled by the division offices in East Pittsburgh.

Allis-Chalmers Half Owner Of Electronics System Firm

Allis-Chalmers Mfg. Co. and Bell & Howell Co., joined recently in ownership of an electronic systems engineering firm. The agreement, announced late in June, said the transaction would be completed that month. Financial details were not disclosed.

R. S. Stevenson, president Allis-Chalmers, and Charles H. Percy, president, Bell & Howell, said that Allis-Chalmers would acquire 50 percent of the common stock of Consolidated Systems Corp., Monrovia, Cal., a wholly owned subsidiary of Bell & Howell's Consolidated Electrodynamics Corp.

Consolidated Systems Corp., with more than 525 employees, has both engineering and manufacturing facilities in a 68,000-sq ft building. As a pioneer in the systems engineering concept it will provide an important new service to Allis-Chalmers equipment users, Mr. Stevenson said.

"In recent years application of electronic instrumentation to industrial processes, including power generation, has increased tremendously," he added. "Many of our customers are now looking for us to provide them not only with industrial equipment, but also the systems control necessary to automate their processes."

Officers of the old firm will continue with the newly formed company.

Communications-Data Process Center for Collins Radio

Collins Radio Co. has started construction of a $750,000 communication and data processing center in northeast Cedar Rapids, Iowa. The building will have two stories and 38,000 sq ft, of space. It will house a fully operational system of Collins single sideband and microwave communication equipment and a centralized computing system. First phase of operations will begin about March 1, 1961.

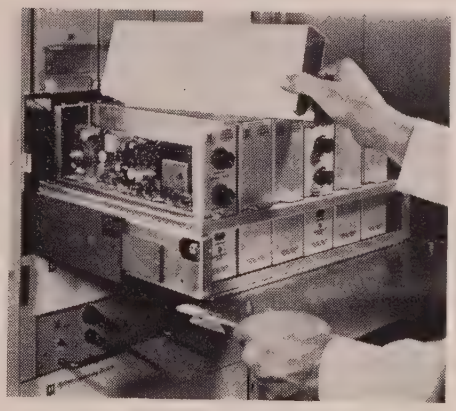
All divisions of Collins through the United States and Canada will send daily operating information to a giant IBM 7070 Computer by a company data link system called Kineplex; then the data will be fed back to individual branches.

The new center will also house the company's central communication switching facilities and will afford more efficient use of Collins' inter-plant network of teleprinter and phone lines.

NEW PRODUCT DESIGN

Solid-State Load, Frequency Control System

An all solid-state load and frequency control system involving new design concepts has been introduced by **Minneapolis Honeywell's Brown Instruments Div.** The modular units of the system require less than half the space formerly required. Major components of the system include high-speed frequency-type telemetering equipment, system control amplifiers, governor motor actuators, rate limiters, incremental loaders and the Honeywell 290 industrial process digital computer, mastermind of the system that will also compute basic cost data for interconnection billing. Special feature of the system is the packaging in a single drawer of all critical test and calibration points, thus providing a central test area. First users of the system will be the Philadelphia Electric Co. and the Iowa-Illinois Gas and Electric Co.



Circle item #21 on reply card

Transformer Mounts

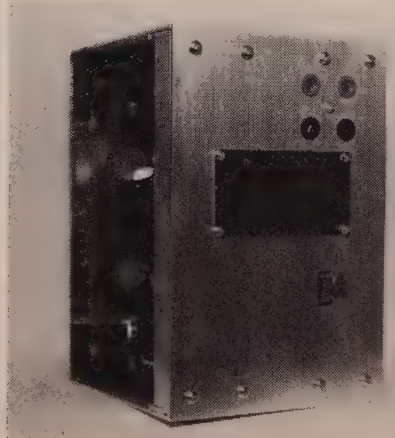
Minit-Mount mounts transformer clusters, capacitor banks, and line-type oil circuit reclosers fast and gives almost three feet of unobstructed working space between transformers. Three of the largest size transformers with 12 in. lug spacing can be mounted with only two through bolts; only four through bolts are required to mount three 167-kva transformers. Slotted holes let transformer lugs slide into perfect alignment instantly. Available from **Graybar Electric Co.**

Circle item #22 on reply card

Thermal Synthesis Relay

A novel relay combines heating effects of positive and negative sequence currents, in weighted fashion, to protect three-phase motors from damage due to any combination of excessive load. Contains matching transformers which can be designed to handle rated currents up to 30 amps, otherwise external current transformers are required. Developed by **Applied Research Associates of Texas.**

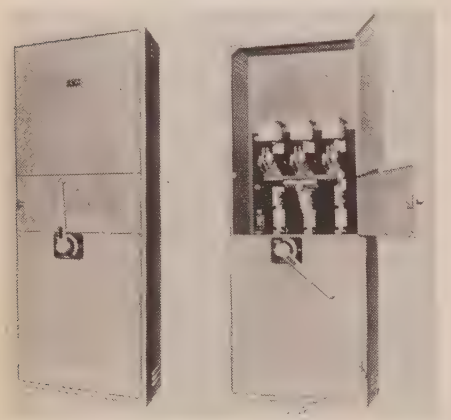
Circle item #23 on reply card

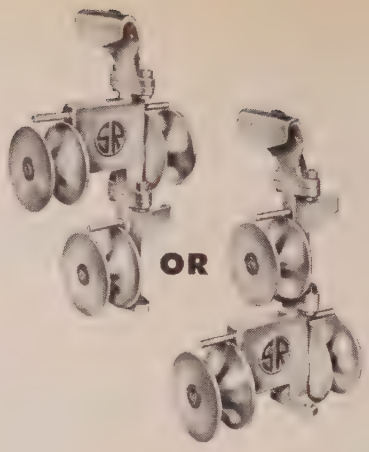


Service Entrance Switches

Bolt-Loc Pressure Contact Switches by **Barkelew Electric** incorporate many new safety features. Arcing and pitting of the main contacts are prevented by auxiliary springs. Double-slot arc quenchers draw the arc from the arc tips, divide, cool, and extinguish it. Interlocks on fuse door are standard, along with a handle padlocking arrangement. Available for 240-, 480, and 600-volt service, fused or unfused.

Circle item #24 on reply card





Cable Stringing Blocks

Model MH-303 Spacer Type Aerial Cable Stringing Block can easily be changed in the field for stringing either the diamond or inverted wye configurations. Aluminum alloy throughout offers high strength and light weight. Guards are provided at each sheave position and at the messenger. Each **Sherman & Reilly** block employs anti-friction ball bearings, permitting accurate sagging and long continuous pulls.

Circle item #25 on reply card

Heavy-Duty Auger

First in a line of super heavy duty earth augers is the Peng AA96 capable of drilling holes 8 f in diameter. Designed for use o the most powerful drilling ma chines, attachment hubs as de signed for 5 in. Kelly bars, but ma be adapted to 3½, 4, or 4½ in. bars AA series augers feature the 20A7 replaceable, reversible, tooth whic is heavier, wider and longer tha the current heavy duty tooth. B **Peterson Engineering Co.**

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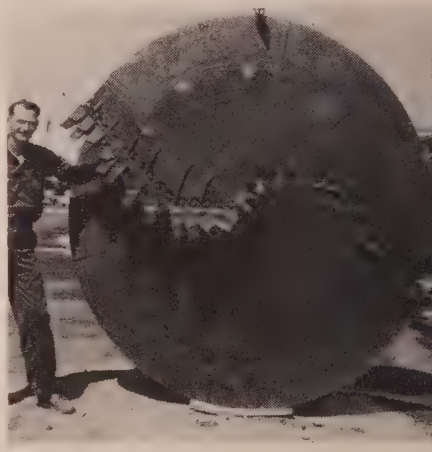


Floor Crane

A portable floor crane with tele scoping mast and boom has bee introduced by the **Therm Machin Co.** Three position arrangement provide a wide range of reach an lift and moving possibilities. Maxi mum reach is 62 in. and maximur boom height is 105 in., while maxi mum load capacity in fully ex tended position is 700 lbs. Doubl acting hydraulic pump permits op erator to lower load at any desire speed.

Circle item #27 on reply card

WHEN TO TREAT . . .

(Continued from page 51)

area. Poles inspected here varied from 15 to 27 years old. In addition to the 3.45 per cent of the whole group rejected, 2.45 percent of these poles had an estimated remaining life of five years or less. Ground-line failure was the cause of most rejections. The Kingsport inspection disclosed that 80 percent of the poles rejected had ground-line failure, 18 percent had dangerous woodpecker holes at the top, and the remaining 2 percent were either cracked, burned, or hit by lightning.

These inspections also showed that poles reset without any re-treatment rotted rather quickly at the ground line, and in some cases had to be replaced in a matter of four or five years. Our inspections have led to two general conclusions:

(1) Poles removed, reclassified, and re-used elsewhere, need a supplementary ground-line treatment.

(2) For pressure-treated southern pine poles, ground-line inspection is a reliable means of establishing a life-extension program.

Curves Suggest When To Treat

Enough inspection and data have been collected in many localities to establish estimated mortality curves of rejected poles (poles that need replacement immediately). Examples of these curves are shown in Fig. 1. Curve A covers poles installed during and right after the war years (1942-1950) when available treating solutions were inferior. It indicates an average life of 26 years when the curve is projected to the point where 50 percent of the poles have been replaced. Curve B indicates an average life of 39 years for poles installed during other periods, which is perhaps more typical.

There is also the matter of service life and mortality providing a considerable difference in the number of years that a pole might be in use in a given location. It now seems likely that a ground-line treatment will be developed to assure the preservative remaining in the ground-line area. Therefore, many of the poles removed from service for reasons other than ground-line failure will be re-used. Service life will then become relatively unimportant. Our study omits this consideration and uses only mortality data because wherever decay has started, the ground-line treatment will be designed to arrest it. A mortality curve is of vital importance, however, and should be carefully compiled from adequate inspection data.

Cost Analysis Shows Pay-Off

Initially, the break-even point where the pole treating cost would equal the cost of replacement was considered as a place to begin treating. Later, this was concluded to be inaccurate because the additional fixed charges attending pole replacement must be paid for the life of the pole.

The table (Fig. 2) was compiled using Curve B and the typical pole costs and assumptions described. The sum of the present worth of annual costs of replacing the poles over their entire average life is $19,233, or considerably more than the sum of the present worth of the annual costs, $14,740, for treating the poles every seven years. If Curve A were used, this comparison would show still greater economic advantage for ground-line treating. Seven years appears to be a reasonable estimate of the lasting qualities of a typical inexpensive ground-line treatment that might be developed for treated southern pine poles.

Recommendation

Since additional fixed charges must be taken each year, the conclusion is that the annual costs in connection with replacement should be avoided. A ground-line treating program should be started on all poles somewhat younger than those showing an established indication of failure. In this example, the first failures occurred at age 18. If this were a firmly established failure age, then a ground-line treatment should have been started far enough in advance of age 18 to have prevented any replacements due to ground-line failure. Practical estimates of this could be from two to three years earlier, or at age 15.

As soon as ground-line treating costs and lasting qualities can be determined, a present worth of annual costs comparison should be made to determine the most economical program.

WIRE AND CABLE ROUND TABLE

You have asked . . .

Q. **How are environmental-stress-crack ratings of polyethylene determined? And is there a standard test?**

A. There is no universally accepted test for environmental-stress cracking (cracking that occurs when PE is subjected to mechanical stress in the presence of an unfavorable chemical environment). However, one test has become nearly standard for defining this phenomenon.

In this test, a ⅛"x½"x1½" sample of polyethylene is slit to a depth of 0.20" with a razor blade. The sample is then bent with the slit on the outside, and the piece is inserted into a test tube containing a reagent. If the grade of PE being tested is susceptible to environmental-stress cracking, the time required for the cracks to appear is noted. Any cracks signify failure. Usually, many samples are tested at once, and the figures reported show the results as "F50 hours" (time to failure of 50% of the samples).

Fortunately for the practical purposes of the user of wire and cable, there is not a confusing myriad of reagents which must be catalogued, nor a wide range of PE's. All polyethylenes are either the high molecular weight, stress-crack-resistant type, or the common insulating type, which is far less resistant to environmental-stress cracking. The former, though somewhat more expensive, is recommended where there is chance of any chemical reagent being present. The latter is suggested only when first costs are unusually important or where the insulation will be protected from chemicals.

Thousands of feet of pneumatic tubing accurately transfer vital test data to one central control room at Air Force research and development center.

MEN OF POWER

Central Illinois E & G Elects Two

Directors of Central Illinois Electric and Gas Company have elected Mr. James E. Murray chairman of the board and principal executive officer and Mr. Hubert E. Braunig president.

Mr. Murray succeeds Mr. Donald C. McClure, who retired from active management and who will continue to serve in an advisory capacity as chairman of the executive committee.

Mr. Braunig moves up from executive vice president and succeeds Mr. Murray, who had been president of the company since 1953.

Mr. Murray came to Rockford as treasurer of the company in 1933, becoming vice president and treasurer in 1944. Previously he had been with Stone & Webster Service Corporation in Boston, Brockton Edison Company, Key West Electric Company, Galveston Electric Company, Sierra Pacific Power Company, Pensacola Electric Company, Western United Gas & Electric Company and Gulf States Utilities Company.

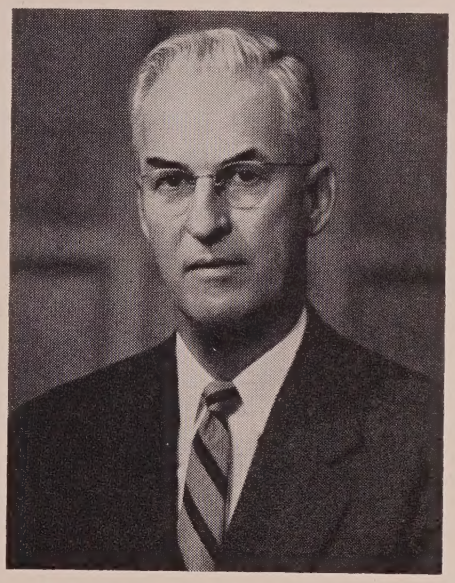
Mr. Braunig came to Rockford in 1942 from Gulf States Utilities Company where he had been transmission and distribution superintendent for electric, gas and water services, Texas and Louisiana divisions. His first utility job was as manager of the Hereford, Texas Light and Power Company from 1915 to 1917, at which time he joined Gulf States.

Perdue To Head PUAA Contest

William L. Perdue, director of publicity, Kansas Power & Light Co., has been named 1960-61 chairman of the Public Utilities Advertising Association's 38th annual Better Copy contest. The annual contest is the oldest advertising competition in the world. More than 2,500 entries were received in the last competition.

Mr. Perdue will head a group of 21 committee chairmen who will judge investor-owned utility newspaper advertisements, direct mail, publications, displays, posters, billboards, annual reports, radio and television, and motion pictures.

Union Electric Names Two Exec. VP's, Comptroller



Gamble

Schettler

New executive vice presidents of Union Electric Co. are George P. Gamble and A. H. Schettler. They were elected at a board of directors meeting July 22. The board also elected R. D. White comptroller. At the same time it was announced that Dudley Sanford, executive vice president since 1954, will retire November 1.

Mr. Gamble will be in charge of operations and will have responsibility for regional matters and labor relations. Mr. Schettler will be in charge of fiscal, commercial, employee relations, and general administrative matters. Mr. White will head the company's comptroller's division.

Mr. Gamble came to Union Electric in 1932 after completion of Bagnell Dam where he had been resident electrical engineer for Stone & Webster, builders of the project. He was named superintendent of production in 1943, and was elected vice president of power production in 1950. Since 1954 he has been operating vice president.

Mr. Schettler was employed as comptroller of Union Electric in 1940, after 16 years with Price Waterhouse & Co. He was elected vice president and comptroller in 1948.

Mr. White came to Union Electric as assistant comptroller in 1941 after 14 years with Price Waterhouse.

Dean To Exide V.P. Post

Oakley N. Dean has been promoted to vice president-manufacturing of Exide Industrial division of the Electric Storage Battery Co.

Mr. Dean, who has been Exide's manufacturing manager for five years, thus assumes responsibility at the highest policy level for the manufacture of Exide batteries and associated products for electric utility, materials handling and other industrial applications.

Joining the company in 1949, he has served as assistant superintendent, assistant to the general superintendent, assistant general superintendent, and in 1955 became manager of the Exide division's manufacturing operation.

MEN OF POWER BRIEFS

UTILITIES

Elected Chairman of the Advertising Committee of EEI is **Osborne K. LeBlanc,** Sales Promotion and Advertising Manager for the Louisiana Power and Light Co.

Philip B. Heartt, secretary of Duke Power since 1955, was recently elected to the Company's Board of Directors.

J. G. Loader has been elected assistant secretary and assistant treasurer of the Florida Power Corp. He was formerly coordinator of the special reports division.

Former regional representative of the Georgia Power Co.'s community development division, **C. Parker McRae,** has been promoted to assistant to the executive vice president of the company.

Kelly W. Sullivan has joined Duke Power Co.'s industrial development department. He is a former director of Esso Standard (Near East), Inc.

Murray Joslin, vice president of Commonwealth Edison Co. has announced the appointment of **Laurence E. Pierron** to the post of commercial manager of the utility. He succeeds **Myron E. Lukey,** who died recently.

Two personnel changes have been announced by Virginia Electric and Power Co. **Lemuel L. Eley, Jr.** has been appointed assistant to the manager of the engineering and construction department. He is succeeded as superintendent of the system transmission and distribution department by **James V. Barker.**

William C. MacInnes, president of the Tampa Electric Co. has been named the recipient of the annual Management Achievement Award, presented by the University of Florida chapter of the Society for Advancement of Management.

In another announcement, **R. N. Robertson** has been promoted to director of residential development. He has been assistant director for the past two years.

President Walker L. Cisler has announced the election of three assistant vice presidents at Detroit Edison. They are **Marshall Pease,** manager of purchases and real estate; **Howard R. Stevenson,** manager of sales; and **Harvey A. Wagner,** manager of system development. New director of area development for the Detroit Edison Co. is **George B. Catlin.**

Daniel K. Park has been appointed assistant to the president and manager of public relations for the Pennsylvania Electric Co. In other personnel changes, **Gene H. Huston** was appointed to the newly created position of system superintendent of distribution, **Joseph P. Callahan** was promoted to operating superintendent of the Northwestern division, and **Robert P. Martin, Jr.,** has been named manager of the Meadville district, succeeding Mr. Callahan.

CONSULTANTS

Judson G. Hyde has been elected treasurer of Burns and Roe, Inc. He has also been elected to the board of directors and will continue his duties as comptroller and director of the company's finance division.

Stone & Webster Engineering Corp. has appointed **William L. Sheets,** vice president, to the post of senior construction manager. In his new capacity, Mr. Sheets will be responsible for the administration and direction of all construction department activities, both domestic and foreign.

MANUFACTURERS

Frank S. Drake has been appointed director of marketing of the Falcon Alarm Co., Inc.

Two personnel changes have been announced by RCA, Data Processing Division. They are **John T. Macri,** manager of custom project sales, and **T. R. McKee,** manager of data handling equipment.

The first Scientific and Engineering Award of Allis-Chalmers Manufacturing Co. has been presented to **William L. Ringland,** chief engineer of the company's motor and generator department. It consisted of a medallion, certificate, and $5,000 for his invention of a new way of transposing conductors in large generators.

Dr. Philip Cooperman, physicist and mathematician, has been named director of research and development, Research-Cottrell, Inc. Dr. Cooperman succeeds **Dr. Harry J. White** in the position.

Memco Engineering & Manufacturing Co., Inc. has announced the recent appointment of **J. W. Timmerman** as vice president of engineering and manufacturing. Mr. Timmerman was formerly development engineer of the switchgear department, Allis-Chalmers Manufacturing Co.

Ralph J. Dikeman, Jr., is marketing manager for Multi-Amp Electronic Corp.

Jasper Blackburn Corporation's new sales manager is **W. J. Clark.**

M. E. Ziegenhagen has been appointed director of advertising and public relations of the Babcock and Wilcox Co.

Marketing manager-power capacitors for Federal Pacific Electric Co. is **C. A. Liming.**

Schwager-Wood Co. has announced the appointment of **Charles H. Cutter** as commercial vice president. For the past thirty-seven years, Mr. Cutter has been associated with Pacific Electric Manufacturing and their successor, Federal Pacific Electric Co.

Frederick F. Oliver has joined the staff of the Electrical Research Laboratory at the Phelps-Dodge Copper Products Corp. He is the former Manager of Research for the Doble Engineering Co.

Recently appointed chief engineer, distribution and transmission hardware, A. B. Chance Co., is **Raymond Martin.**

Harry L. Peters has been named product engineering manager of Daystrom, Inc., Weston Instruments Division.

R. T. & E. Corporation's new distribution transformer plant in Arlington, Texas, will be managed by **D. M. Parrish.** He has been with the firm since 1948.

Carroll V. Roseberry, Westinghouse Electric Corp., vice president in charge of the Midwestern Region, has been awarded the Westinghouse Order of Merit, the highest honor the company can bestow on an employee. He was cited for: "His remarkable ability to develop customer confidence, particularly in the electric utility field, and for his executive leadership in the Midwestern region; for his outstanding contribution to company progress through the organization of its commercial atomic power activities, and for his cooperation with others in all departments of Westinghouse, particularly his guidance to young men just beginning their careers."

Also at Westinghouse, **H. W. Rainey, Jr.,** has been appointed marketing manager of the Sturtevant division. He was the former general sales manager of the division.

Appointment of **K. Russell Knobauch** as market sales manager for its Industrial Products Group, has been announced by Minneapolis-Honeywell Regulator Co.

D. W. Elliott has joined Highway Trailer Co. as chief engineer of the public utility division.

Joseph C. Freeland has been named by Arvin Industries, Inc. as sales manager for the firm's Electric heat division.

New manager of conduit and building wire sales, National Electric Division of H. K. Porter Co., Inc., is **Arthur J. Conley.**

Recent promotions and appointments at General Electric include: **Stacy W. Goostree, Jr.,** manager of marketing, and **George A. Hagger-**, manager, process computers, both of the Computer Department; **James M. McDonald,** manager-marketing medium transformer department; **Harold A. Carlson,** manager-electric utility and transportation sales, gas turbine department; **Charles D. Brown,** manager-marketing, instrument department; **J. J. William Brown,** manager-direct conversion project operation, electric utility system engineering and planning operation department; **James J. Farrell,** southern regional sales manager, distribution transformer department; **Robert E. Kurtz,** general manager, general purpose control department.

Dr. James R. Donnalley has been appointed general manager of G-E's insulating materials department. He succeeds **Theodore C. Ohart,** who has been appointed general manager of the company's wire and cable department, Bridgeport, Conn. Also at G-E, **Milton F. Kent** has been named manager of the newly-created electric-utility marketing operation.

Recent reassignments at Allis-Chalmers include the election of **J. D. Greensward** as president, Canadian Allis-Chalmers Limited. Other changes include: **W. C. Henderson,** manager of utility sales and **A. W. Leighton,** manager of industrial sales, Los Angeles district; **Charles E. Muller,** manager of utility sales, San Francisco district; **C. F. O'Riordan,** manager of the north central regional, industries group; **R. E. Morris,** manager of the industries group's midwest region; and **J. A. Sudduth,** manager of the St. Louis district, industries group.

Two personnel changes at Allis-Chalmers were also announced. **G. A. Saar,** general manager, mechanical department, and **W. M. Terry,** general manager electrical department.

I-T-E Circuit Breaker Co. has announced that **John M. Hottenstein** has been named manager of the Kelman Power Circuit Breaker division. Replacing Mr. Hottenstein as manager of the switchboard section, switchboard division is **John R. Chamberlin.** Also, **William P. Bolger** former manager of the small circuit breaker division, has been appointed manager of the special products division. He is succeeded by **W. Harold Edmunds,** former chief engineer of the small circuit breaker division.

C. F. Hendrie has been announced as utility consultant for steam power products for the Worthington Corp. Appointed manager of steam power sales was **J. R. Matullo.**

CALENDAR OF EVENTS

September 7-9—Northwest Electric Light and Power Association, Annual Convention, Glacier Park Lodge, Glacier National Park, Mont.

September 7-9 — American Society of Mechanical Engineers, Joint Automatic Control Conference, Massachusetts Institute of Technology, Cambridge, Mass.

September 15-16—American Society of Mechanical Engineers, Engineering Management Conference, Morrison Hotel, Chicago, Ill.

September 21-23—Inter-Industry Farm Electric Utilization Council, National Electric Farm Power Conference, Hotel Louisville, Louisville, Ky.

September 26-30 — Instrument Society of America, Fall Instrument - Automation Conference and 15th Annual Meeting, New York Coliseum, New York, N. Y.

September 28-30—Indiana Electric Association, 51st Annual Convention, French Lick-Sheraton Hotel, French Lick, Ind.

September 29-30—Electric Companies Public Information Program, 1960 PIP Workshop Conference, Sheraton-Charles Hotel, New Orleans, La.

September 29-30—Southeastern Electric Exchange, Accounting Conference, Tides Hotel, St. Petersburg, Fla.

October 5-7—Wisconsin Utilities Association, Electric and Gas Sales and Operating Sections Convention, Schroeder Hotel, Milwaukee, Wisc.

October 6-7—Electric Council of New England, Transmission and Distribution Committee Meeting, Lake Morey Inn, Fairlee, Vt.

October 9-14—American Institute of Electrical Engineers, Fall General Meeting, Morrison Hotel, Chicago, Ill.

October 20-22—Electric Companies Public Information Program, Second National Youth Conference on the Atom, Museum of Science and Industry, Chicago, Ill.

November 9-11—American Institute of Electrical Engineers, Second Power Industry Computer Application Conference, Chase Hotel, St. Louis, Mo.

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